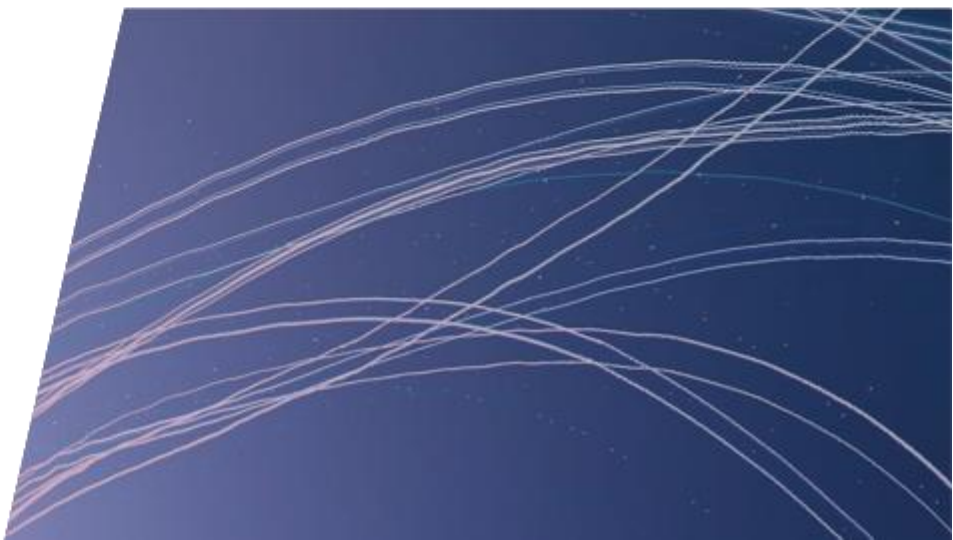
Aeronautical Study
Rathcoole developments near Casement Aerodrome



Aviation Safety • Efficiency
Capacity • Environment

Aeronautical Study Rathcoole developments near Casement Aerodrome

Report

Version 3.0

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Executive summary

Rose Aviation has requested To70 to conduct an aeronautical study to assess the (potential) impact of the two planned developments on the flight operations and the published instrument flight procedures at Casement Aerodrome. The location of the planned developments is approximately 1.5 km south of the Casement Aerodrome (EIME) in Baldonnel, Dublin, Ireland.

If the construction affects the published procedures, an obstacle clearance limitation altitude or a minimum gradient for the relevant instrument flight procedures is to be specified.

The conclusions reported in this study clearly indicate that:

1. The proposed developments do not negatively affect the currently published Instrument Flight Procedures at Casement Aerodrome (EIME) in Baldonnel, and
2. No mitigation is required.

Any change in the geometry of the proposed developments or change in the Instrument Flight Procedures considered for this aeronautical study will require further analysis.

1 Introduction

1.1 Objective of this study

Rose Aviation has requested To70 to conduct an aeronautical study to assess the (potential) impact of the two planned developments on the flight operations and the published instrument flight procedures at Casement Aerodrome. The location of the planned developments is approximately 1.5 km south of the Casement Aerodrome (EIME) in Baldonnel, Dublin, Ireland.

If the construction affects the published procedures, an obstacle clearance limitation altitude or a minimum gradient for the relevant instrument flight procedures is to be specified.

The assumptions and conclusions of this study are presented in this report.

1.2 Report structure

The report is structured as follows:

- Chapter 1 is this introduction;
- Chapter 2 specifies the data of the planned developments and the used aeronautical data and regulations;
- Chapter 3 lists the instrument flight procedures to be reviewed;
- Chapter 4 contains the assessment of PANS-OPS surfaces;
- Chapter 5 provides conclusions and recommendations for mitigations if applicable.

2 Data and regulations

2.1 Planned obstacle locations and height

All information regarding the planned developments was provided by Rose Aviation in August 2026 (Figure 2-1). The two planned developments are located south of Casement Aerodrome (EIME), at Rathcoole Park, Dublin.

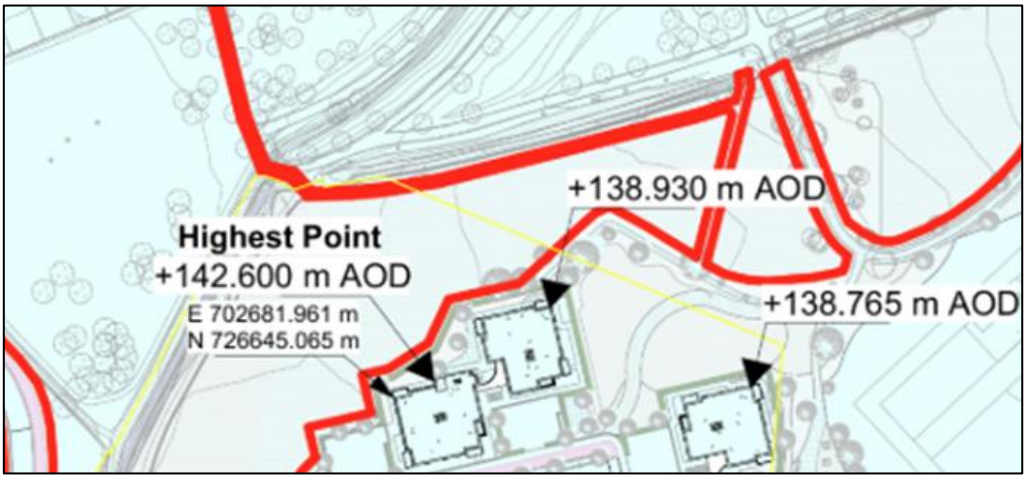


Figure 2-1. Planned developments data

Obstacle	Coordinates (Local system: ITM)	Coordinates (WGS-84)	Top elevation (AMSL)
Vertex	Easting: 702681.838 Northing: 726645.434	53° 16' 48.63" N 006° 27' 36.91" W	142.60 m

Table 2-1. Coordinates conversion

The analysis is based on the following data and assumptions:

- Since the elevation of the two proposed buildings hasn't been defined yet, a maximum elevation of 142.60 m AMSL (as provided by Rose Aviation) has been applied to both developments.
- The perimeter of the two areas was determined through the georeferencing process of the drawing provided by Rose Aviation and by using the coordinates listed in Figure 2-1.
- A safety margin of 5 meters has been applied around the extracted perimeters.



Figure 2-2. Planned obstacle locations near Casement Aerodrome (EIME)

2.2 Aeronautical data used

The planned obstacles are assessed on the basis of the most actual aeronautical information given on the public website of the Irish Defense Forces, effective as of 19 March 2026 (https://www.military.ie/en/public-information/aeronautical-data/).

The Runway physical characteristic used in this study are given below (Figure 2-3).

Designations RWY NR	TRUE BRG	Dimensions of RWY	Strength (PCN) and surface of RWY and SWY	THR coordinates RWY end coordinates THR Geoid undulation	THR elevation and highest elevation of TDZ of precision APP RWY
1	2	3	4	5	6
10	101.917°	1828M x 45M	PCN 52/F/D/W/T ASPHALT -	THR: 531816.87N 0062807.75W END: 531805.85N 0062640.67W GEOID: 184ft	THR 283ft TDZ 291ft
28	281.937°	1828M X 45M	PCN 52/F/D/W/T ASPHALT -	THR: 531805.85N 0062640.67W END: 531816.87N 0062807.75W GEOID: 184ft	THR 315ft
04	040.926°	1462M X 45M	PCN 46/F/D/W/T ASPHALT -	THR: 531736.90N 0062713.73W END: 531812.62N 0062622.01W GEOID: 184ft	THR 319ft
22	220.937°	1462M X 45M	PCN 46/F/D/W/T ASPHALT -	THR: 531812.62N 0062622.01W END: 531736.90N 0062713.73W GEOID: 184ft	THR 305ft

Figure 2-3. Runway physical characteristics

2.3 Regulations and guidance material

The following regulations and guidance material have been applied for the aeronautical study:

Document	Edition
ICAO Doc 8168 Vol II Procedures for Air Navigation Services – Aircraft Operations Construction of Visual and Instrument Flight Procedures	7th edition, 2020, 10th AMDT
ICAO EB 013	8th July 2026
EASA SD 2026-1	6th August 2026

2.4 Specific requirements

In the surroundings of the aerodrome there is no mountainous terrain as defined in Doc 8168. The highest terrain elevations within 10 NM from the aerodrome do not exceed 750 m AMSL. This means that the standard MOC values can be applied.[1]

[1] According to ICAO Doc 8168, mountainous terrain is defined as areas where terrain elevation changes exceed 900 m (3,000 ft) within 18.5 km (10.0 NM). In these areas the minimum obstacle clearance (MOC) should be increased by as much as 100 per cent (i.e. the MOC is doubled).

3 Relevant flight procedures

3.1 Assessed flight procedures

The assessment of the two proposed developments is conducted for all relevant flight procedures as published by the Irish Defence Forces. These procedures are shown in the table below, with reference to the associated paragraph number in this document:

Chart number	Effective date	Flight procedures	Paragraph
EIME AD 2.24-8	30 OCT 2025	Instrument Departure Chart [BAL] - RWYS 04/10/22/28, CAT A, B	4.1
EIME AD 2.24-9	30 OCT 2025	Instrument Departure Chart [BAL] - RWYS 04/10/22/28, CAT C, D	4.1
EIME AD 2.24-10	30 OCT 2025	Instrument Approach Chart - ILS Z RWY 10, CAT A, B	4.2.1
EIME AD 2.24-11	30 OCT 2025	Instrument Approach Chart - ILS Y RWY 10, CAT C, D	4.2.1
EIME AD 2.24-15	30 OCT 2025	Instrument Approach Chart - VOR RWY 10	4.2.2
EIME AD 2.24-16	30 OCT 2025	Instrument Approach Chart - VOR RWY 28	4.2.4
EIME AD 2.24-17	30 OCT 2025	Instrument Approach Chart - VOR RWY 22	4.2.3
EIME AD 2.24-20	30 OCT 2025	Instrument Approach Chart - SRA RWY 10	4.2.6
EIME AD 2.24-22	30 OCT 2025	ATC Radar Vectoring Chart [CAT A, B, C, D]	4.6
EIME AD 2.24-25	30 OCT 2025	Missed Approach with Communications Failure	See other approach charts
EIME AD 2.24-30	03 OCT 2024	Instrument Departure Chart [DAP] - RWYS 04/10/22/28, CAT A, B	4.1
EIME AD 2.24-31	03 OCT 2024	Instrument Departure Chart [DAP] - RWYS 04/10/22/28, CAT C, D	4.1
EIME AD 2.24-32	27 NOV 2025	Instrument Approach Chart - ILS X RWY 10, CAT A, B	4.2.1
EIME AD 2.24-33	27 NOV 2025	Instrument Approach Chart - ILS W RWY 10, CAT C, D	4.2.1
EIME AD 2.24-35	30 OCT 2025	Instrument Approach Chart - RNP RWY 28, CAT A, B, C, D	4.2.5
Approach charts	NIL	Circling areas	4.3
Approach charts	NIL	Holdings	4.4
Approach charts Departure charts	NIL	Minimum Sector Altitudes (MSA)	4.5

4 PANS-OPS assessment

4.1 Standard Instrument Departures

There are four published departure charts for EIME:

- EIME AD 2.24-8 Departures based on DVOR/DME BAL for ACFT CAT A/B (Figure 4-3);
- EIME AD 2.24-9 Departures based on DVOR/DME BAL for ACFT CAT C/D (Figure 4-4);
- EIME AD 2.24-30 Departures based on DVOR/DME DAP for ACFT CAT A/B (Figure 4-5);
- EIME AD 2.24-31 Departures based on DVOR/DME DAP for ACFT CAT C/D (Figure 4-6).

These charts are shown on the following pages. The charts show similar procedures and trajectories, which only slightly differ because they are published for different ACFT categories and/or because the final segments are based on a different VOR/DME.

All Standard Instrument Departures (SIDs) published for EIME are conventional departures with a straight climb out on runway track and a turn at altitude as first departure segment.

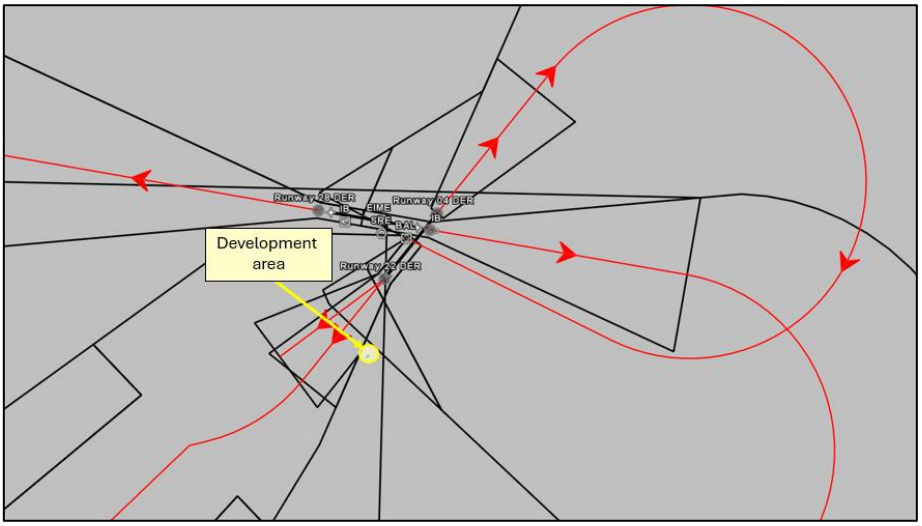


Figure 4-1. Casement Aerodrome SIDs (Case of CAT A/B)

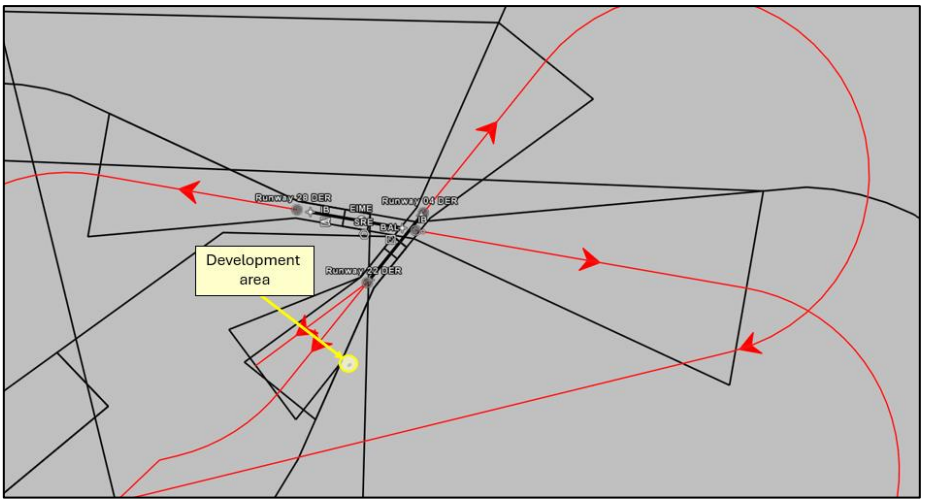


Figure 4-2. Casement Aerodrome SIDs (Case of CAT C/D)

The proposed developments are positioned within the turn areas or the following SIDs:

- SIDs RWY 04
- SIDs RWY 10
- SIDs RWY 28

In the turn area of instrument departures, the maximum obstacle altitude can be calculated as follows:

$$Maximum\ obstacle\ elevation = TNA + d_o\ PDG\ - MOC$$

If the extra height permitted due to $[d_o * PDG]$ is ignored the formula can be simplified as follows:

$$Max\ OBST\ ALT = TNA - MOC$$

Based on this simplified formula the Max OBST elevation is defined as given in below table. The calculated Max OBST ALT in the turn area is higher than the proposed developments. There is thus no impact on the SIDs.

IFPs	TNA	TNA	MOC	Max OBST elevation	OBST elevation	Impact OBST on IFP?
Turning departures RWY 04 & 28	1000 ft	304.80 m	75.0 m	229.80 m (at least *)	142.60 m	No
Turning departures RWY 10	1300 ft	396.24 m	75.0 m	321.24 m (at least *)	142.60 m	No

* The max OBST elevation is in fact even higher since the extra height permitted due to $[d_o * PDG]$ has been ignored.

Table 4-1. Turning departures analysis and results (simplified)

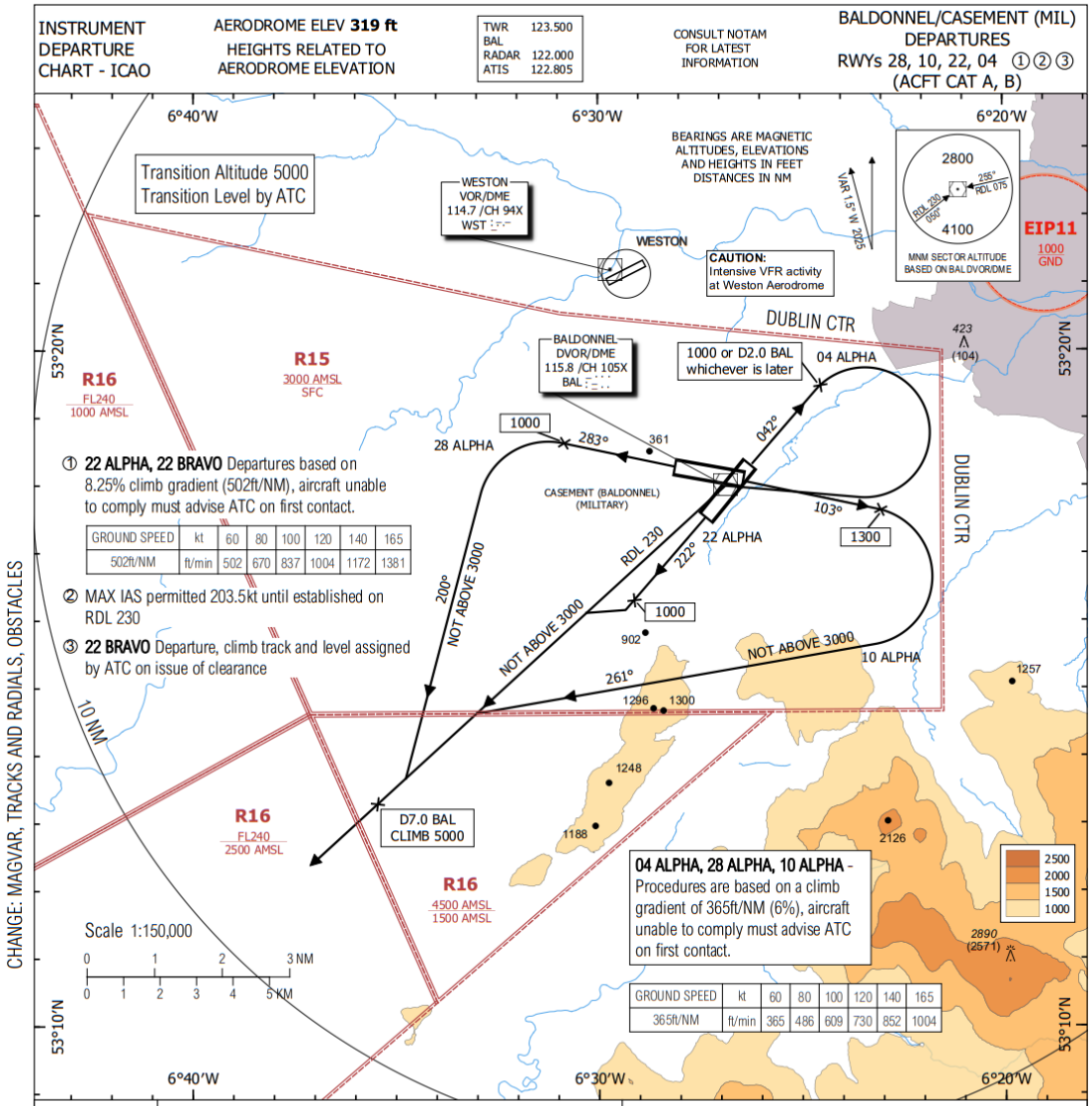
IFPs	MOC	Penetration	OBST elevation	Impact OBST on IFP?
Turning departures RWY 04	75.0 m	-183.94 m	142.60 m	No
Turning departures RWY 10	75.0 m	-223.59 m	142.60 m	No
Turning departures RWY 28	75.0 m	-158.80 m	142.60 m	No

Table 4-2. Turning departures analysis and results (detailed)

The proposed developments will certainly have no impact on the other SIDs since the obstacles are positioned outside the protection areas of:

- the turn initiation areas of all SIDs,
- the turn areas of the SIDs for RWY 22.

IRISH AIR CORPS EIME AD 2.24-8

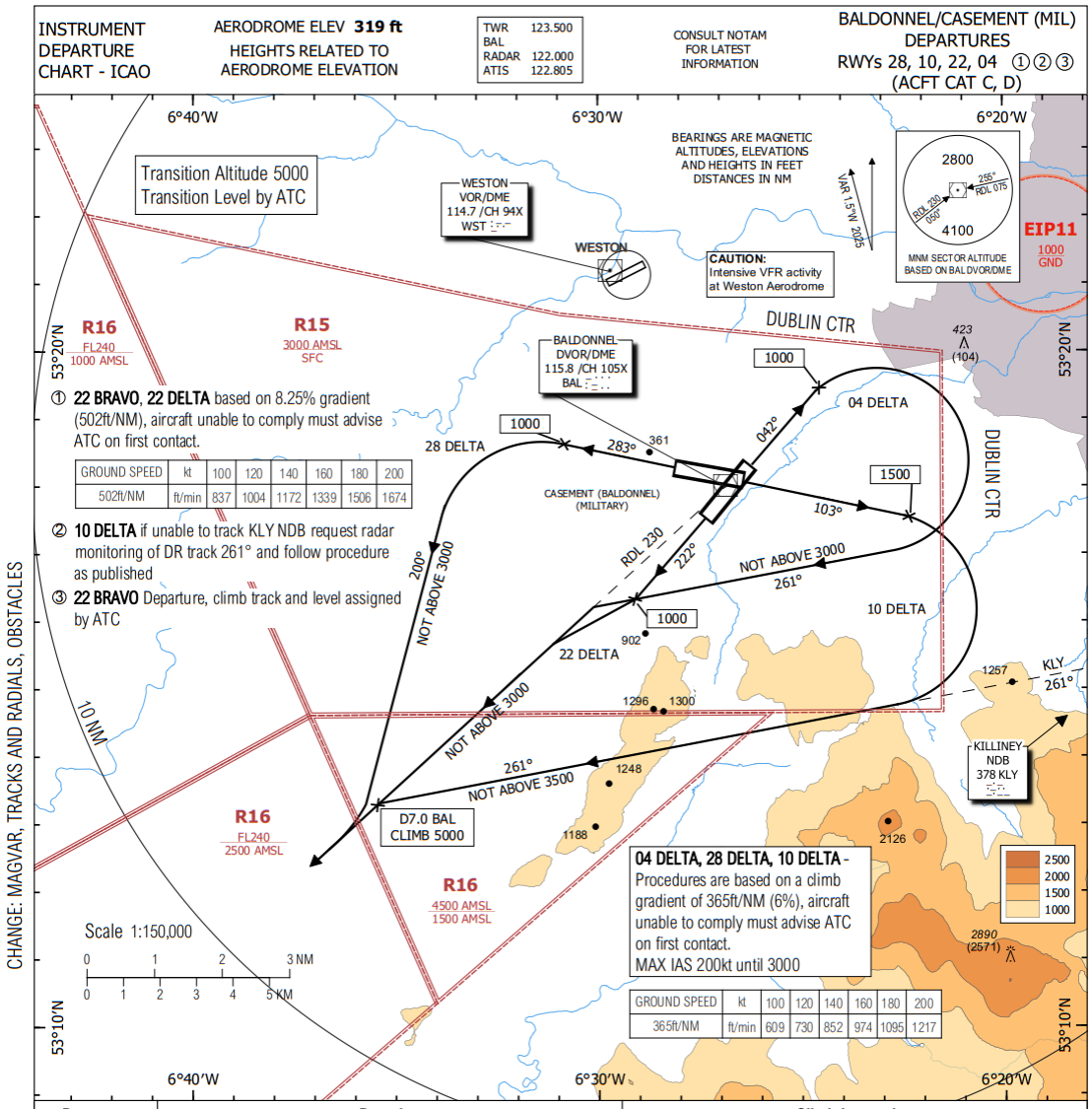


Departure	Routeing	Climb Instruction
04 ALPHA	Climb on runway track, at 1000 or D2.0 BAL DME, whichever is later, turn right inbound to BAL VOR, from BAL track RDL 230	Climb 3000 Passing D7.0 BAL outbound on RDL 230 continue climb to 5000 Maintain 6% climb gradient until 2800
28 ALPHA	Climb on runway track, at 1000 turn left to track 200°, to intercept RDL 230 BAL outbound	Climb 3000 Passing D7.0 BAL outbound on RDL 230 continue climb to 5000 Maintain 6% climb gradient until 2800
10 ALPHA	Climb on runway track, at 1300 turn right to track 261°, to intercept RDL 230 BAL outbound	Climb 3000 Passing D7.0 BAL outbound on RDL 230 continue climb to 5000 Maintain 6% climb gradient until 2800
22 ALPHA	Climb on runway track, at 1000 turn right to intercept RDL 230 BAL outbound	Climb 3000 Passing D7.0 BAL outbound on RDL 230 continue climb to 5000 Maintain 8.25% climb gradient until 2800
22 BRAVO	Climb on track 237°, at 1000 turn right to track assigned by ATC	Climb to assigned level Maintain 8.25% climb gradient until initial assigned level

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Figure 4-3. SID Chart based on BAL DVOR/DME (ACFT CAT A/B)

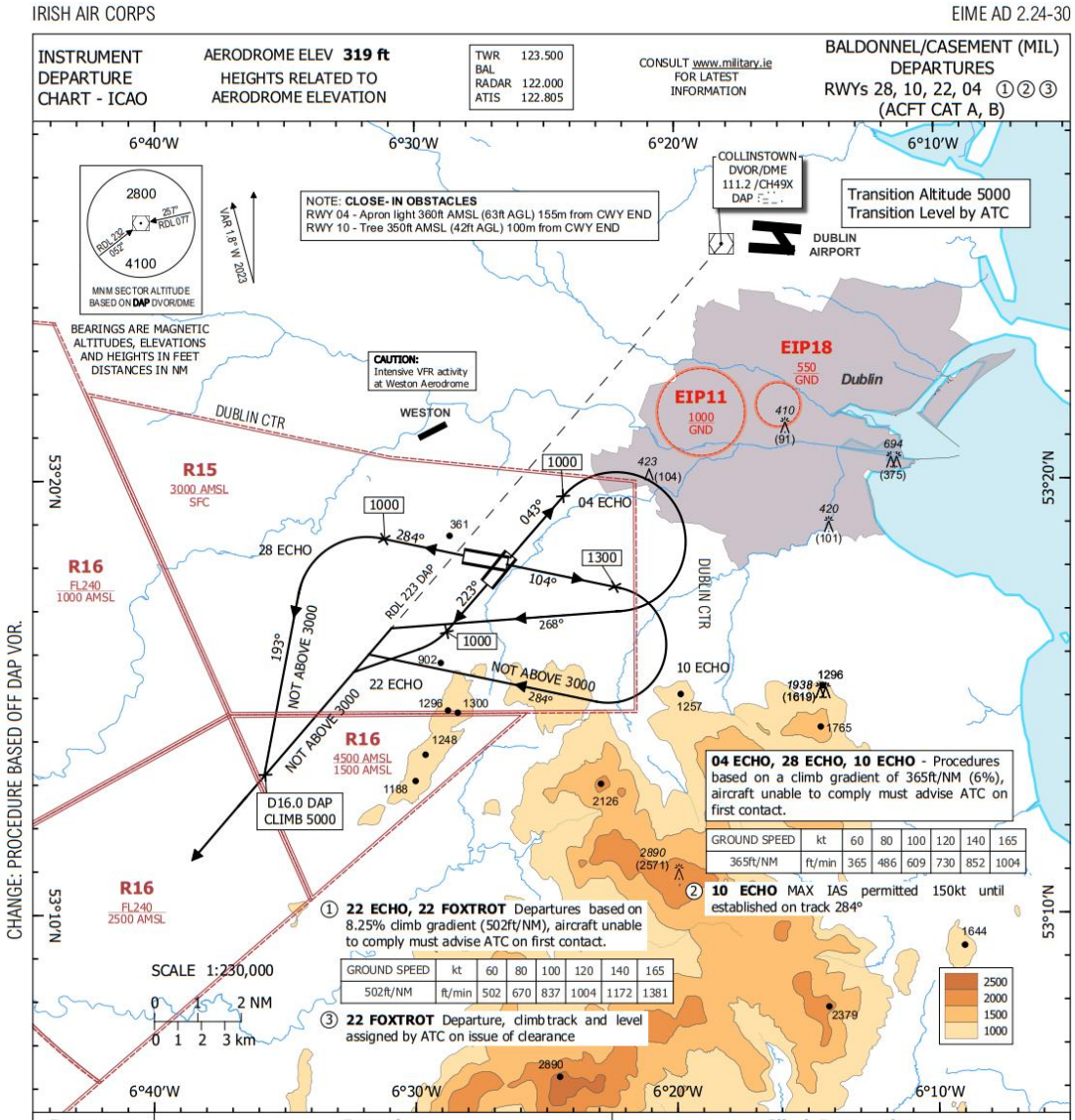
IRISH AIR CORPS EIME AD 2.24-9



Departure	Routeing	Climb Instruction
04 DELTA	Climb on runway track,at 1000 turn right to track 261°, to intercept RDL 230 BAL outbound	Climb 3000 Passing D7.0 BAL outbound on RDL 230 continue climb to 5000 Maintain 6% climb gradient until 2800
28 DELTA	Climb on runway track, at 1000 turn left to track 200°, to intercept RDL 230 BAL outbound	Climb 3000 Passing D7.0 BAL outbound on RDL 230 continue climb to 5000 Maintain 6% climb gradient until 2800
10 DELTA ②	Climb on runway track, at 1500 turn right to intercept bearing 261° from KLY to intercept RDL 230 BAL outbound	Climb 3500 Passing D7.0 BAL outbound on RDL 230 continue climb to 5000 Maintain 6% climb gradient until 3100
22 DELTA	Climb on runway track, at 1000 turn right to intercept RDL 230 BAL outbound	Climb 3000 Passing D7.0 BAL outbound on RDL 230 continue climb to 5000 Maintain 8.25% climb gradient until 2800
22 BRAVO ③	Climb on track 237°, at 1000 turn right onto track assigned by ATC	Climb to assigned level Maintain 8.25% climb gradient until initial assigned level

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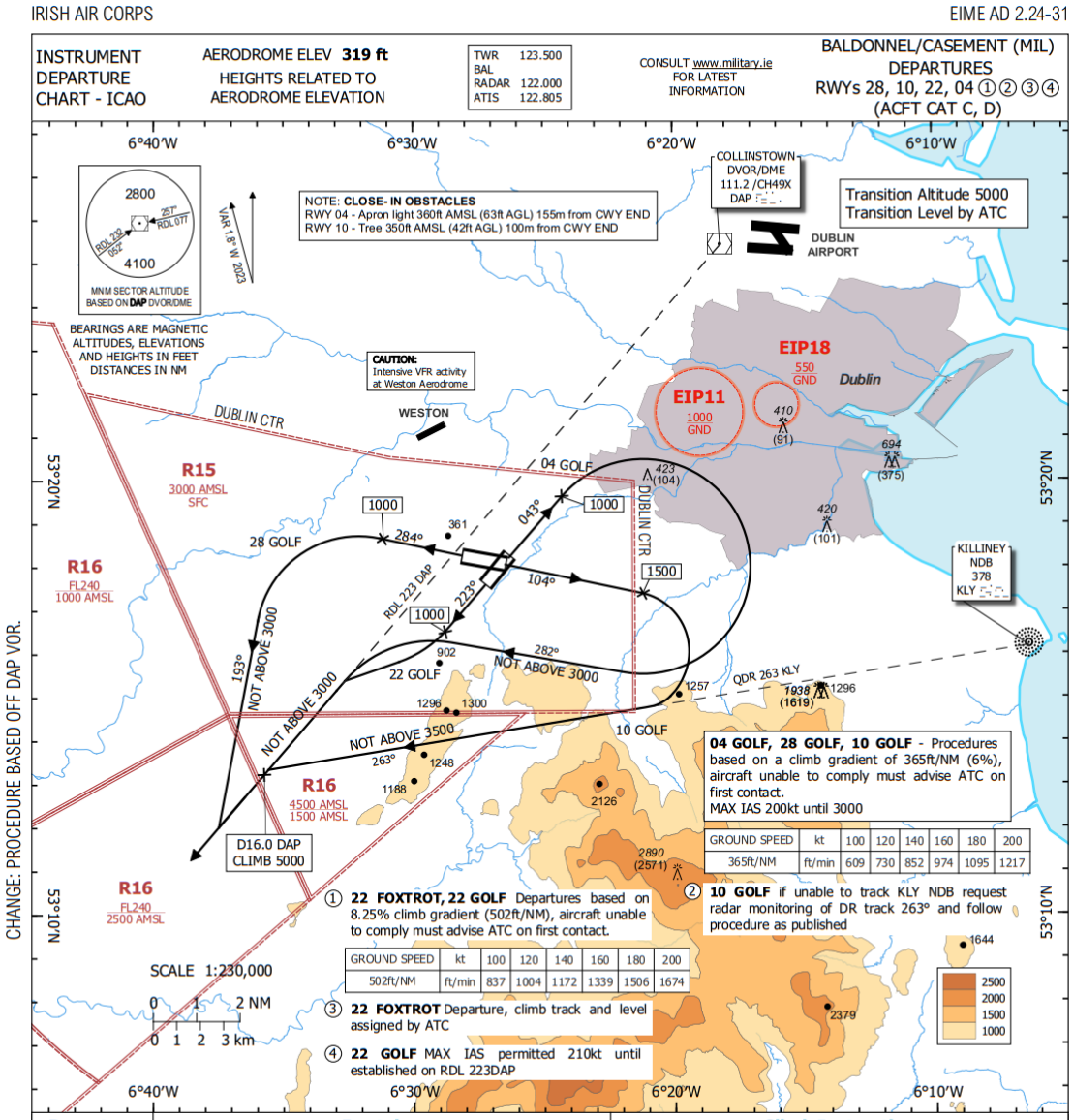
Figure 4-4. SID Chart based on BAL DVOR/DME (ACFT CAT C/D)



Departure	Routeing	Climb Instruction
04 ECHO	Climb on runway track, at 1000 turn right to track 268° to intercept RDL 223 DAP outbound	Climb 3000 Passing D16.0 DAP outbound on RDL 223 continue climb to 5000. Maintain 6% climb gradient until 2800
22 ECHO ①	Climb on runway track, at 1000 turn right to intercept RDL 223 DAP outbound	Climb 3000 Passing D16.0 DAP outbound on RDL 223 continue climb to 5000. Maintain 8.25% climb gradient until 2800
10 ECHO ②	Climb on runway track, at 1300 turn right to track 284° to intercept RDL 223 DAP outbound	Climb 3000 Passing D16.0 DAP outbound on RDL 223 continue climb to 5000. Maintain 6% climb gradient until 2800
28 ECHO	Climb on runway track, at 1000 turn left to track 193° to intercept RDL 223 DAP outbound	Climb 3000 Passing D16.0 DAP outbound on RDL 223 continue climb to 5000. Maintain 6% climb gradient until 2800
22 FOXTROT ①③	Climb on track 238°, at 1000 turn right to track assigned by ATC	Climb to assigned level Maintain 8.25% climb gradient until initial assigned level

APPROVED BY GOC AIR CORPS 03 OCT 2024

Figure 4-5. SID Chart based on DAP DVOR/DME (ACFT CAT A/B)



Departure	Routeing	Climb Instruction
04 GOLF	Climb on runway track, at 1000 turn right to track 282° to intercept RDL 223 DAP outbound	Climb 3000 Passing D16.0 DAP outbound on RDL 223 continue climb to 5000. Maintain 6% climb gradient until 2800
22 GOLF ①④	Climb on runway track, at 1000 turn right to intercept RDL 223 DAP outbound	Climb 3000 Passing D16.0 DAP outbound on RDL 223 continue climb to 5000. Maintain 8.25% climb gradient until 2800
10 GOLF ②	Climb on runway track, at 1500 turn right to intercept bearing 263° from KLY to intercept RDL 223 DAP outbound	Climb 3500 Passing D16.0 DAP outbound on RDL 223 continue climb to 5000. Maintain 6% climb gradient until 2800
28 GOLF	Climb on runway track, at 1000 turn left to track 193° to intercept RDL 223 DAP outbound	Climb 3000 Passing D16.0 DAP outbound on RDL 223 continue climb to 5000. Maintain 6% climb gradient until 2800
22 FOXTROT ①③	Climb on track 238°, at 1000 turn right to track assigned by ATC	Climb to assigned level. Maintain 8.25% climb gradient until initial assigned level

Figure 4-6. SID Chart based on DAP DVOR/DME (ACFT CAT C/D)

4.2 Instrument Approaches

4.2.1 ILS approach RWY 10

There are four published approach charts for ILS approach RWY 10:

- EIME AD 2.24-10 - Instrument Approach Chart - ILS Z RWY 10, for CAT A, B (Figure 4-9);
- EIME AD 2.24-11 - Instrument Approach Chart - ILS Y RWY 10, for CAT C, D (Figure 4-10);
- EIME AD 2.24-32 - Instrument Approach Chart - ILS X RWY 10, for CAT A, B (Figure 4-11);
- EIME AD 2.24-33 - Instrument Approach Chart - ILS W RWY 10, for CAT C, D (Figure 4-12).

These charts are shown on the following pages.

The charts are applicable for different aircraft categories (A/B versus C/D) but are more or less similar. ILS X and ILS W have a different initial approach and a different holding at the IAF, but the missed approaches are the same as in the ILS Z and ILS Y procedures. The following assessment applies for the M/A on all of the four charts mentioned above.

The proposed developments may have impact on the missed approach (M/A) procedure.

The proposed developments are positioned outside the OAS and the turn initiation area of the missed approach. Therefore, they shall be assessed for the turning M/A only.

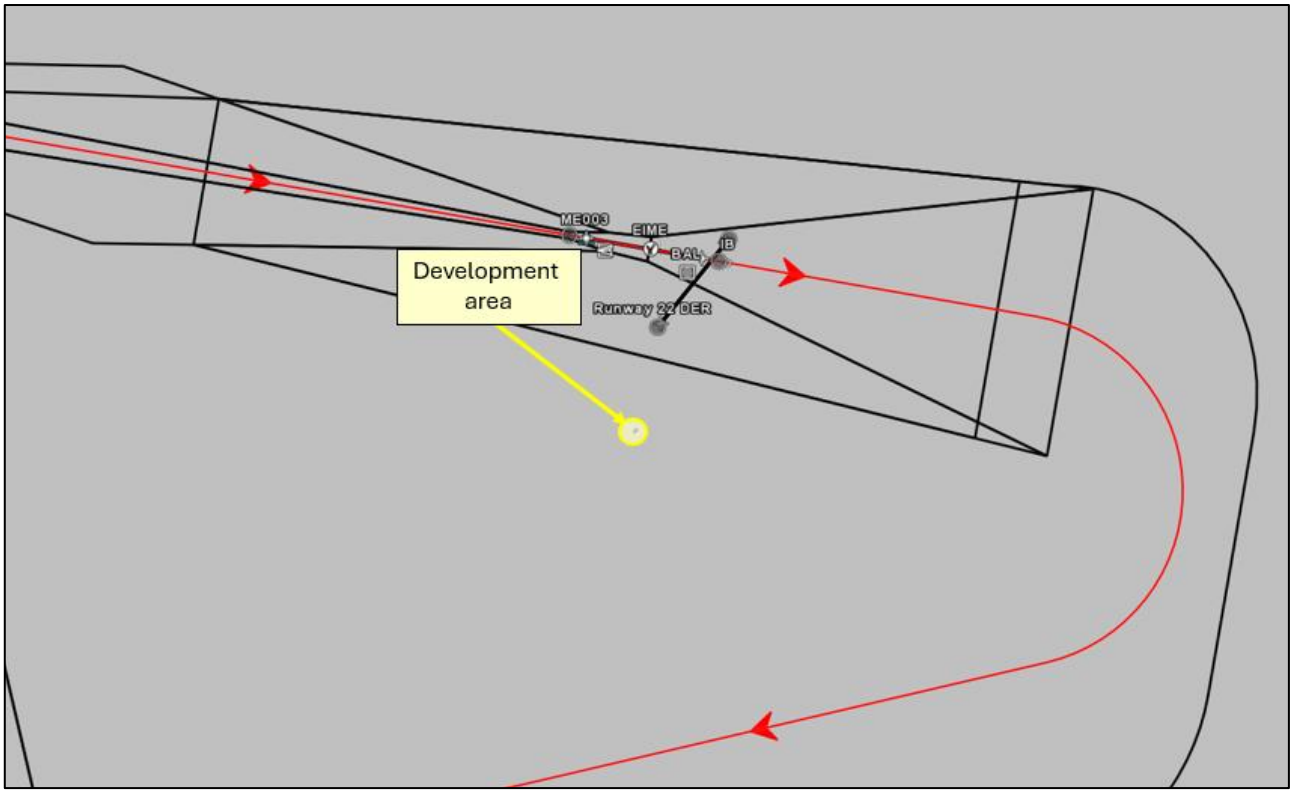


Figure 4-7. ILS Approach RWY 10 (A/B)

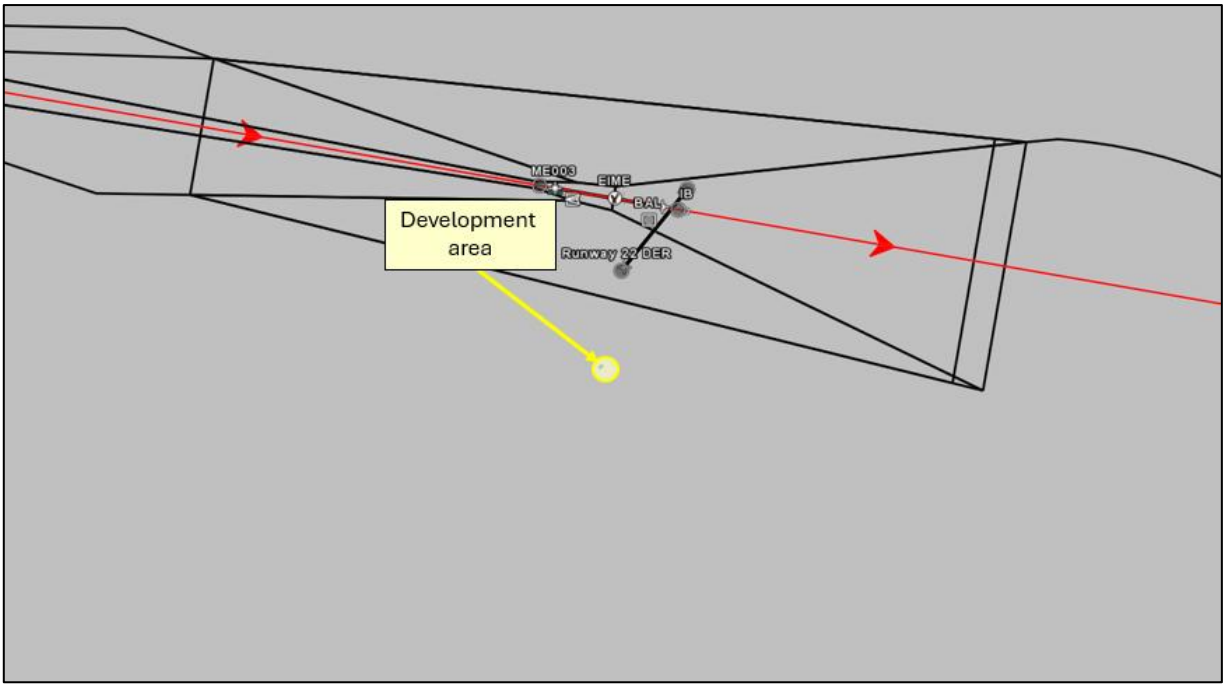


Figure 4-8. ILS Approach RWY 10 (C/D)

The proposed developments are positioned outside the turn initiation area. The required TNA for an obstacle in the turn initiation area is calculated as follows for the ILS approach:

Required TNA = OBST_ELEV + MOC

It shall be noted that since the obstacles are positioned in the turn area then the d_0 should be also taken into consideration for a more accurate result (as reported in the detailed analysis below) regarding the maximum obstacle elevation.

The planned obstacles would have no impact on the turning missed approach since the calculated Max OBST elevation in the turn area is higher than the proposed developments.

IFP	OBST elevation	MOC	MAX OBST elevation		Published TNA	Impact OBST on IFP?
Tuning M/A ILS RWY 10	142.60 m	50.0 m	346.20 m	1136.96 ft	1300 ft (A/B) 2000 ft (C/D)	No

Table 4-3. Turning missed approach of ILS approach RWY 10 analysis and results (simplified)

IFPs	MOC	Penetration *	OBST elevation	Impact OBST on IFP?
Tuning M/A ILS RWY 10 (A/B)	50.0 m	-229.06 m	142.60 m	No
Tuning M/A ILS RWY 10 (C/D)		-442.21 m		

* It shall be noted that the values reported for each category are related to a climb gradient of 5.0%. The penetration for CAT A/B refers to CAT B as more penalizing, the penetration for CAT C/D refers to CAT D as more penalizing.

Table 4-4. Turning missed approach of ILS approach RWY 10 analysis and results (detailed)

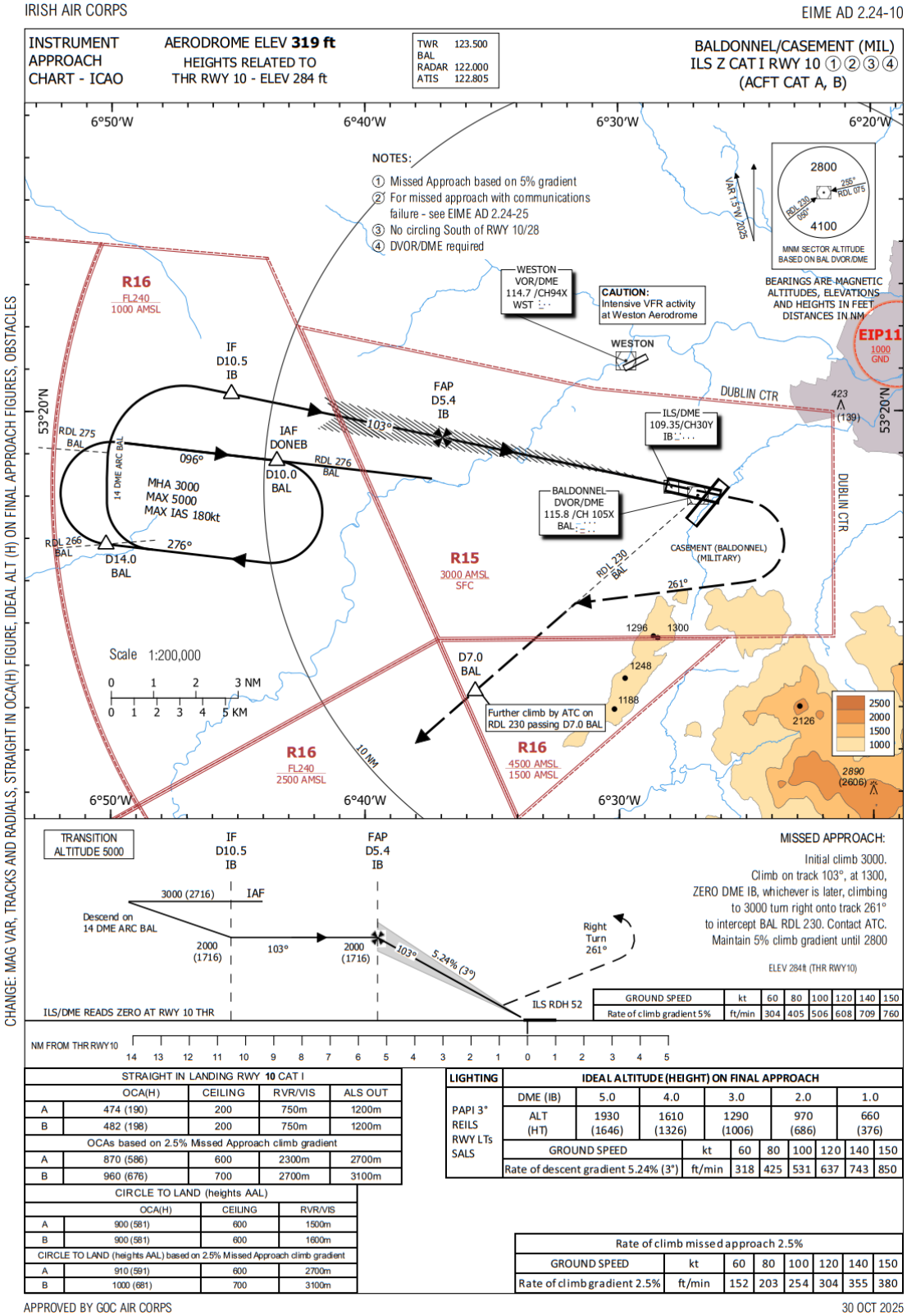


Figure 4-9. Chart ILS Z Approach RWY 10 (CAT A/B)

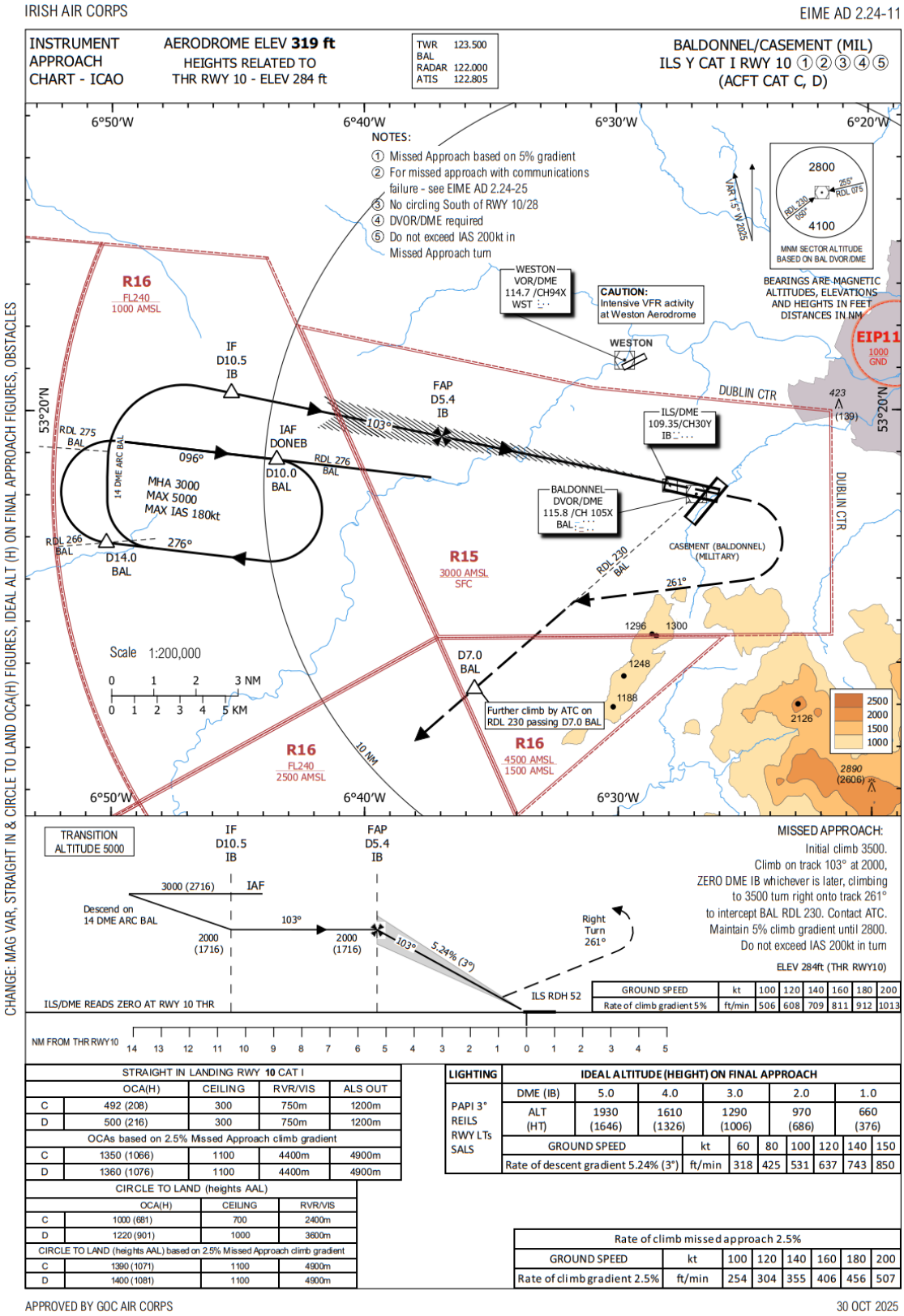


Figure 4-10. Chart ILS Y Approach RWY 10 (CAT C/D)

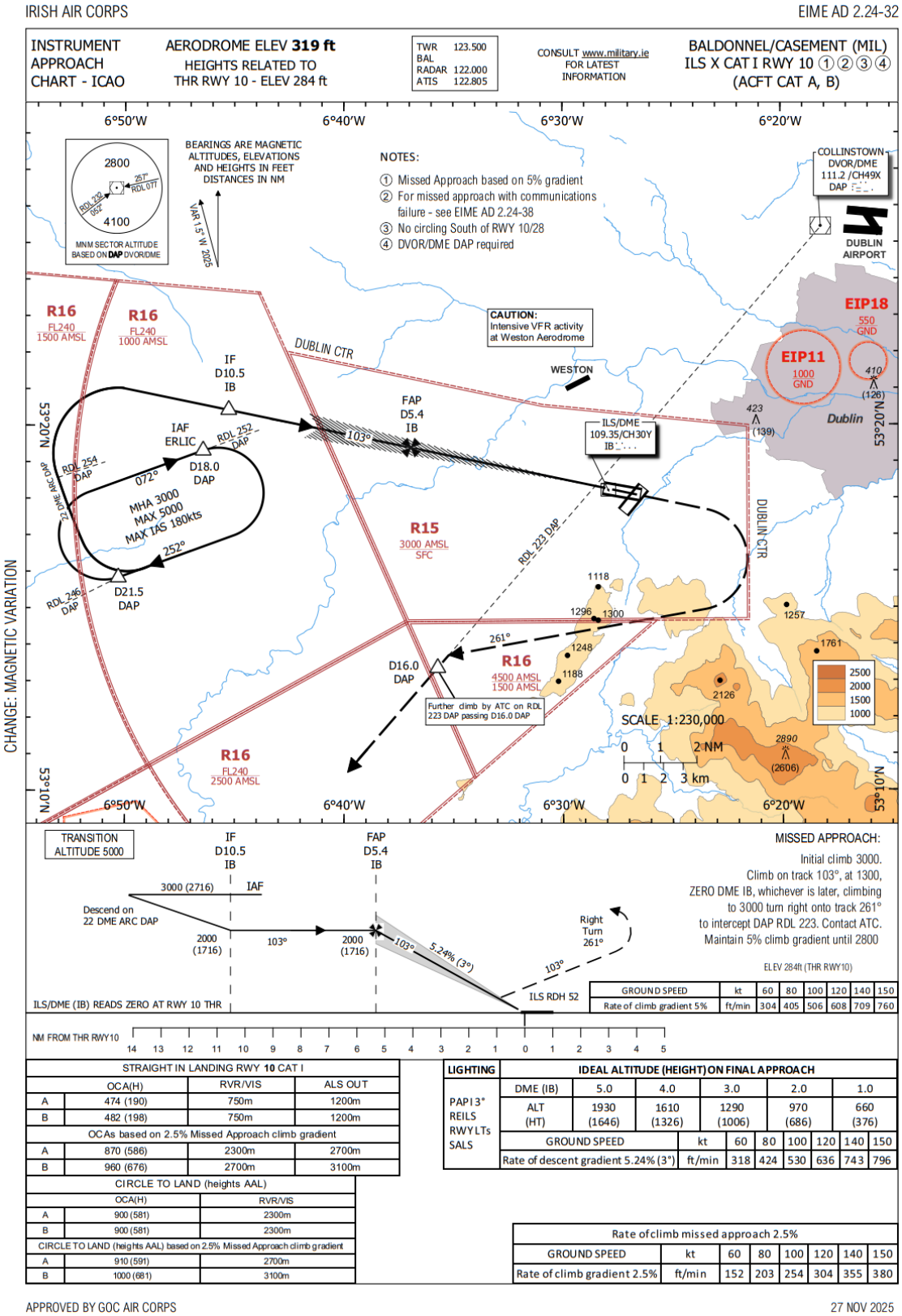


Figure 4-11. Chart ILS X Approach RWY 10 (CAT A/B)

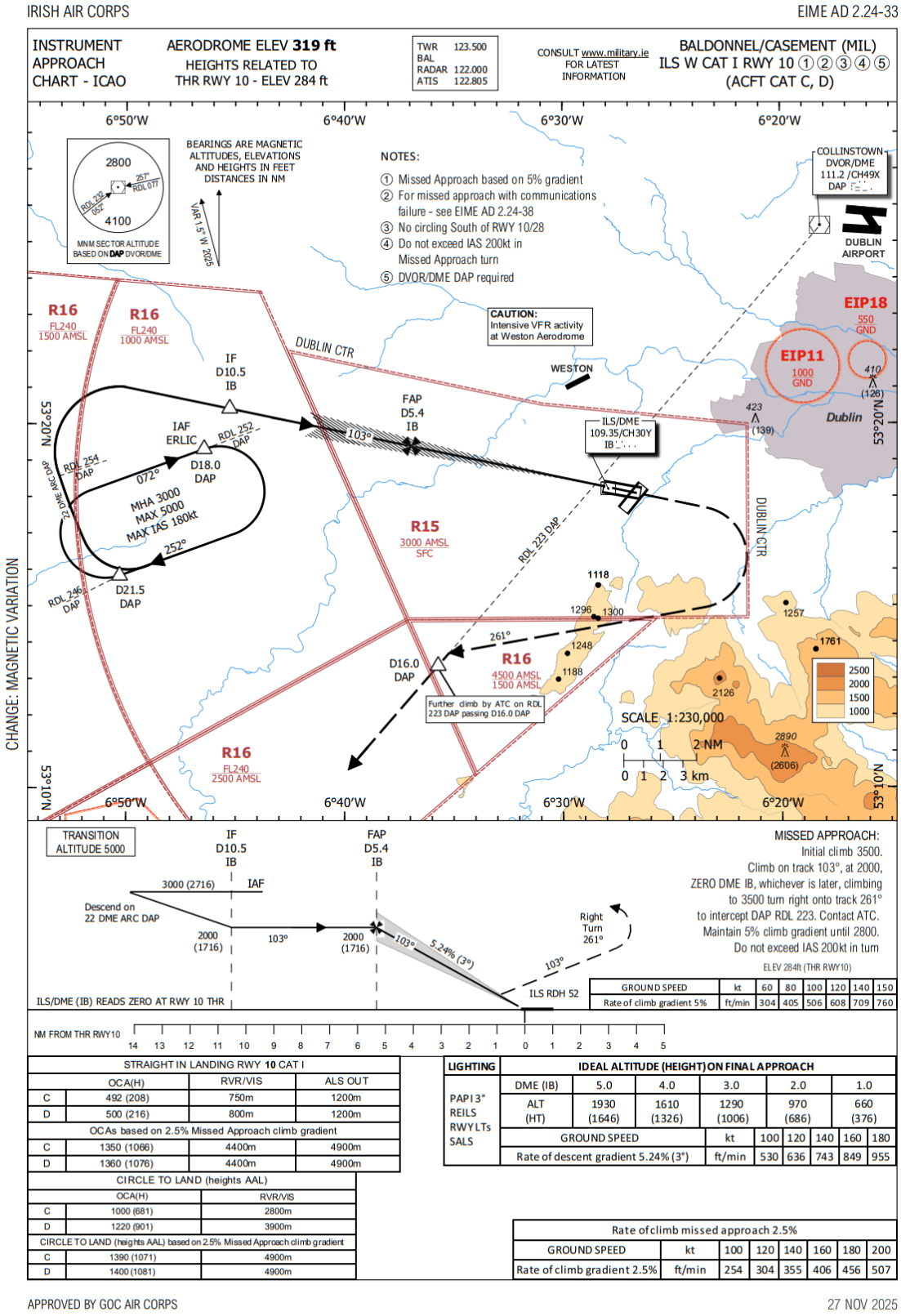


Figure 4-12. Chart ILS W Approach RWY 10 (CAT C/D)

4.2.2 VOR approach RWY 10

There is one published approach chart for VOR approach RWY 10 (Figure 4-14):

- EIME AD 2.24-15 - Instrument Approach Chart - VOR RWY 10, for CAT A, B, C, D.

The planned developments may have impact on the missed approach (M/A) procedure. The proposed developments are positioned outside the turn initiation area of the missed approach and shall be assessed for the turning M/A only.



Figure 4-13 Missed approach of VOR approach RWY 10

The proposed developments are positioned outside the turn initiation area. The required TNA for an obstacle outside the turn initiation is calculated as follows for the VOR approach:

Required TNA = OBST_ELEV + MOC

It shall be noted that since the obstacles are positioned in the turn area then the d_0 should be also taken into consideration for a more accurate result (as reported in the detailed analysis below) the maximum obstacle elevation.

The planned obstacles would have no impact on the turning missed approach since the calculated Max OBST elevation in the turn area is higher than the proposed developments.

IFPs	OBST elevation	MOC	MAX OBST elevation		Published TNA	Impact OBST on IFP?
Tuning M/A VOR RWY 10	142.60 m	50.0 m	407.21 m	1336.96 ft	1500 ft	No

Table 4-5. Turning missed approach of VOR approach RWY 10 analysis and results (simplified)

IFPs	MOC	Penetration	OBST elevation	Impact OBST on IFP?
Tuning M/A VOR RWY 10	50.0 m	-272.10 m	142.60 m	No

Table 4-6. Turning missed approach of VOR approach RWY 10 analysis and results (detailed)

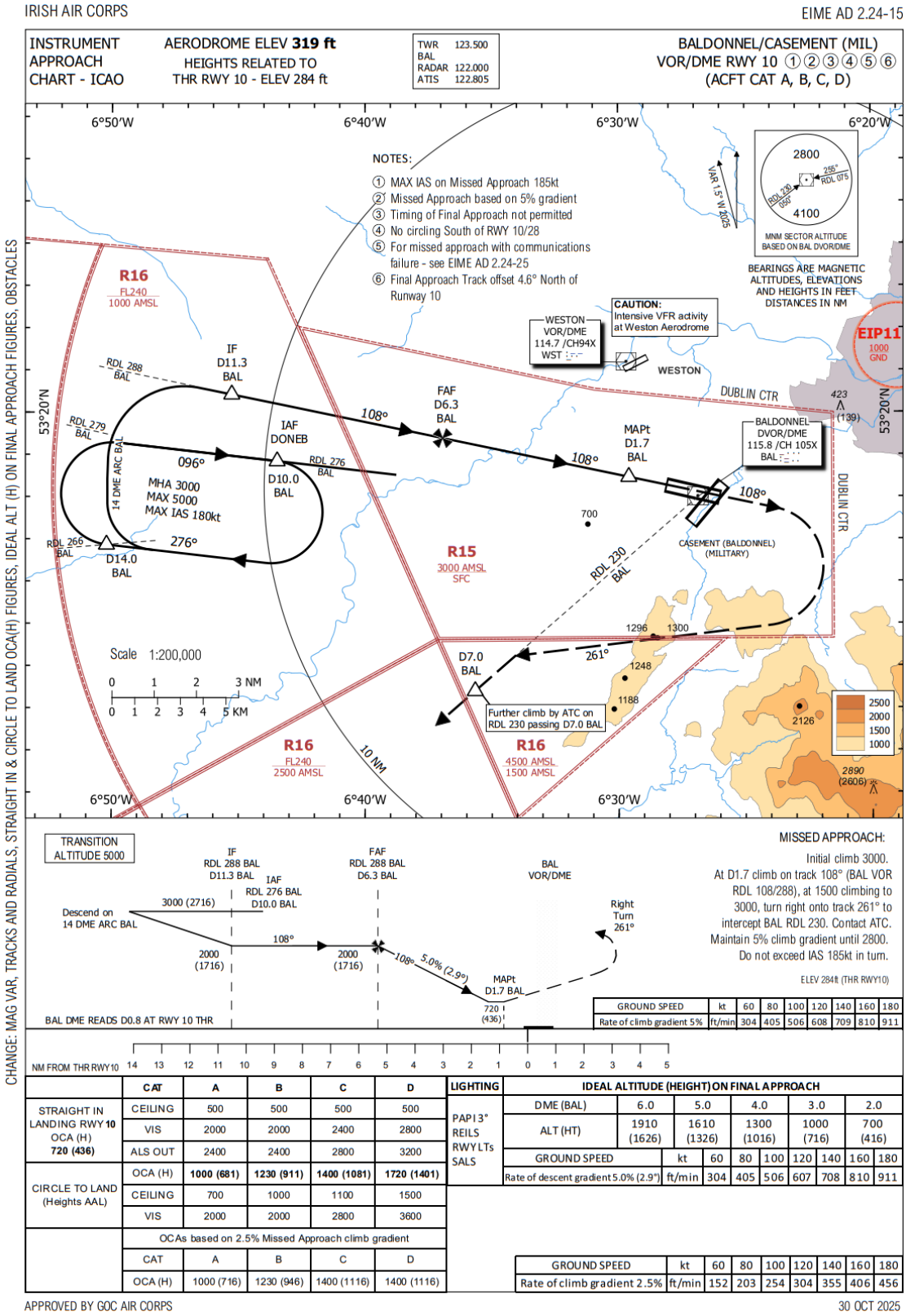


Figure 4-14 Chart VOR approach RWY 10

4.2.3 VOR approach RWY 22

There is one published approach chart for VOR approach RWY 22 (Figure 4-16):

- EIME AD 2.24-17 - Instrument Approach Chart - VOR RWY 22, for CAT A, B, C, D.

The MAPt is positioned at 1.5 NM before DME BAL. The missed approach initially climbs on track 224° MAG to BAL and turns right at DVOR/DME BAL to intercept radial 230 BAL, while climbing to 3000 ft.

The proposed developments are positioned in the straight missed approach. Since the turn angle is less than 15° the turn is to be considered as a straight M/A; there is no turning missed approach.

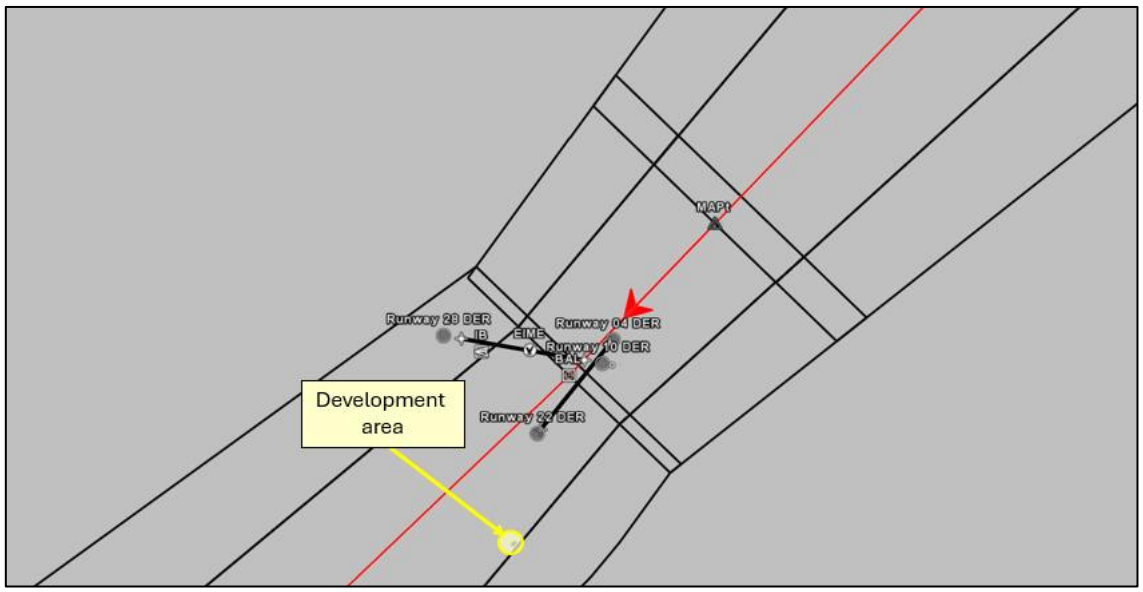
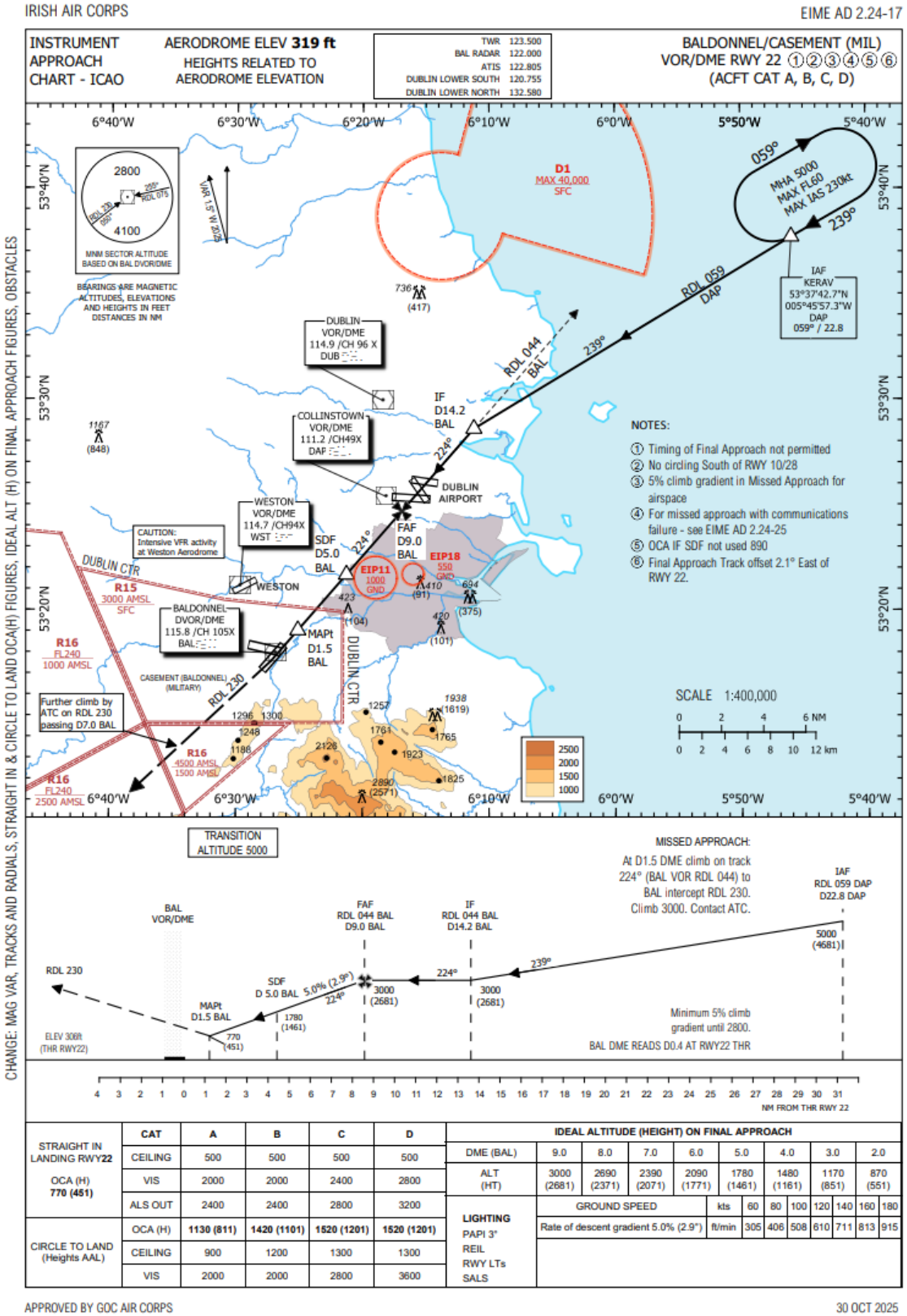


Figure 4-15. Missed approach of VOR approach RWY 22

The calculated maximum obstacle elevation is given in below table. The proposed developments would have no impact on the straight missed approach since the published calculated maximum obstacle elevation is considerably higher due to the published airspace climb gradient of 5.0% (while the calculation has been conducted assuming a 2.5% because of obstacles only).

IFPs	OCA	MOC	Max OBST elevation	OBST elevation	Impact OBST on IFP?
Straight M/A VOR RWY 22	770 ft	30.0 m	246.92 m	142.60 m	No

Table 4-7. Straight missed approach of VOR approach RWY 22 analysis and results



	CAT	A	B	C	D
STRAIGHT IN LANDING RWY22	CEILING	500	500	500	500
OCA (H) 770 (451)	VIS	2000	2000	2400	2800
	ALS OUT	2400	2400	2800	3200
CIRCLE TO LAND (Heights AAL)	OCA (H)	1130 (811)	1420 (1101)	1520 (1201)	1520 (1201)
	CEILING	900	1200	1300	1300
	VIS	2000	2000	2800	3600

IDEAL ALTITUDE (HEIGHT) ON FINAL APPROACH								
DME (BAL)	9.0	8.0	7.0	6.0	5.0	4.0	3.0	2.0
ALT (HT)	3000 (2681)	2690 (2371)	2390 (2071)	2090 (1771)	1780 (1461)	1480 (1161)	1170 (851)	870 (551)
LIGHTING PAPI 3° REIL RWY LTs SALS	GROUND SPEED				kts	60	80	100	120	140	160	180
	Rate of descent gradient 5.0% (2.9°)				ft/min	305	406	508	610	711	813	915

Figure 4-16. Chart VOR approach RWY 22

4.2.4 VOR approach RWY 28

There is one published approach chart for VOR approach RWY 28 (Figure 4-18):

- EIME AD 2.24-16 - Instrument Approach Chart - VOR RWY 28, for CAT A, B, C, D.

The proposed developments may have impact on the missed approach (M/A) procedure.

The missed approach starts at the MAPt, positioned 1.5 NM east of DME BAL, and initially climbs on track 275° MAG (RWY track is 283° MAG) and turns left at 1100 ft AMSL, while climbing further to 3000 ft. The turn may not be initiated at 1100 ft if DVOR/DME BAL hasn't been reached yet (in that case the turn altitude would be higher).

The proposed developments are positioned in the turn initiation area of the missed approach and shall be assessed both for the straight M/A and for the turning M/A.

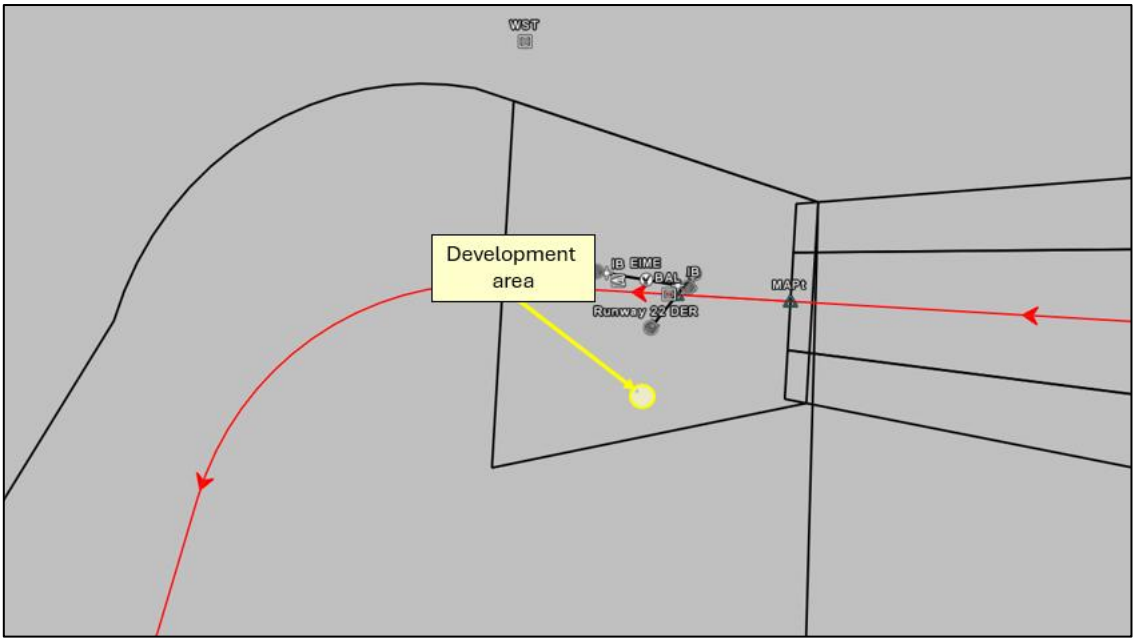


Figure 4-17. VOR Approach RWY 28

Straight M/A

The calculated maximum obstacle elevation is given in below table. The proposed developments would have no impact on the straight missed approach since the published calculated maximum obstacle elevation is considerably higher due to the published airspace climb gradient of 5.0% (while the calculation has been conducted assuming a 2.5% because of obstacles only).

IFPs	OCA	MOC	Max OBST elevation	OBST elevation	Impact OBST on IFP?
Straight M/A VOR RWY 28	800 ft	30.0 m	218.55 m	142.60 m	No

Table 4-8. Straight missed approach of VOR approach RWY 28 analysis and results

Turning M/A

The required TNA for an obstacle in the turn initiation is calculated as follows:

Required TNA = OBST_ELEV + MOC

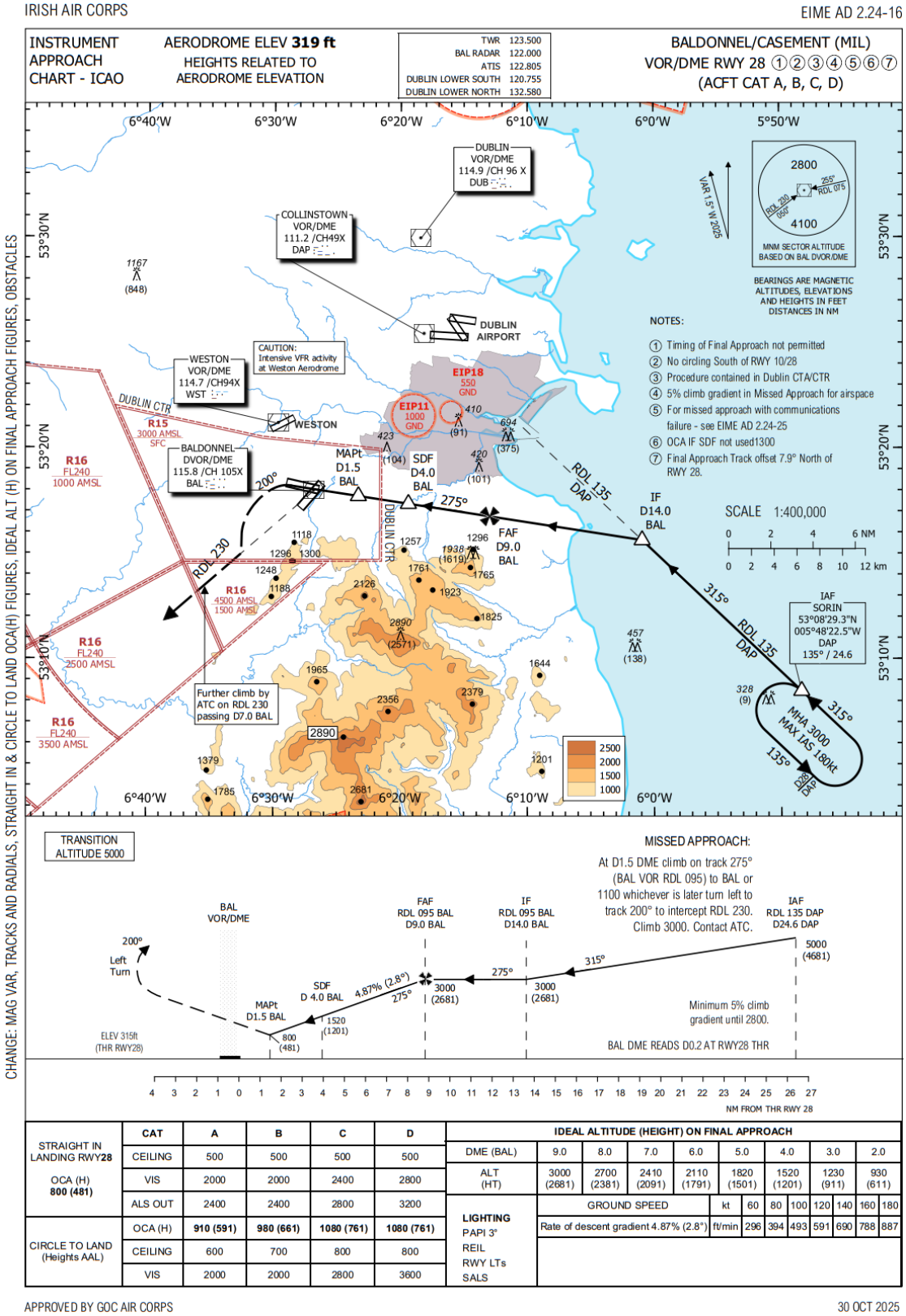
The calculated required TNA is given in below table. The proposed developments would have no impact on the turning missed approach since the published TNA is considerably higher than the required TNA.

IFPs	OBST elevation	MOC	Required TNA		Published TNA	Impact OBST on IFP?
Tuning M/A VOR RWY 28	142.60 m	50.0 m	192.60 m	631.88 ft (700 ft)	1100 ft	No

Table 4-9. Turning missed approach of VOR approach RWY 28 analysis and results (simplified)

IFPs	MOC	Penetration	OBST elevation	Impact OBST on IFP?
Tuning M/A VOR RWY 28	30.0 m	-75.94 m	142.60 m	No

Table 4-10. Turning missed approach of VOR approach RWY 28 analysis and results (detailed)



	CAT	A	B	C	D
STRAIGHT IN LANDING RWY28	CEILING	500	500	500	500
OCA (H) 800 (481)	VIS	2000	2000	2400	2800
	ALS OUT	2400	2400	2800	3200
CIRCLE TO LAND (Heights AAL)	OCA (H)	910 (591)	980 (661)	1080 (761)	1080 (761)
	CEILING	600	700	800	800
	VIS	2000	2000	2800	3600

IDEAL ALTITUDE (HEIGHT) ON FINAL APPROACH								
DME (BAL)	9.0	8.0	7.0	6.0	5.0	4.0	3.0	2.0
ALT (HT)	3000 (2681)	2700 (2381)	2410 (2091)	2110 (1791)	1820 (1501)	1520 (1201)	1230 (911)	930 (611)

LIGHTING	GROUND SPEED	kt	60	80	100	120	140	160	180
PAPI 3°	Rate of descent gradient 4.87% (2.8°)	ft/min	296	394	493	591	690	788	887
REIL									
RWY LTs									
SALS									

Figure 4-18. Chart VOR Approach RWY 28

4.2.5 RNP approach RWY 28

There is one published approach chart for RNP approach RWY 28 (Figure 4-21):

- EIME AD 2.24-35 - Instrument Approach Chart - RNP RWY 28, for CAT A, B, C, D

The proposed developments are evaluated against the three minima published on the chart:

- LNAV
- LNAV/VNAV
- LPV

LNAV

The proposed developments are positioned outside the LNAV minima protection areas (Figure 4-19).

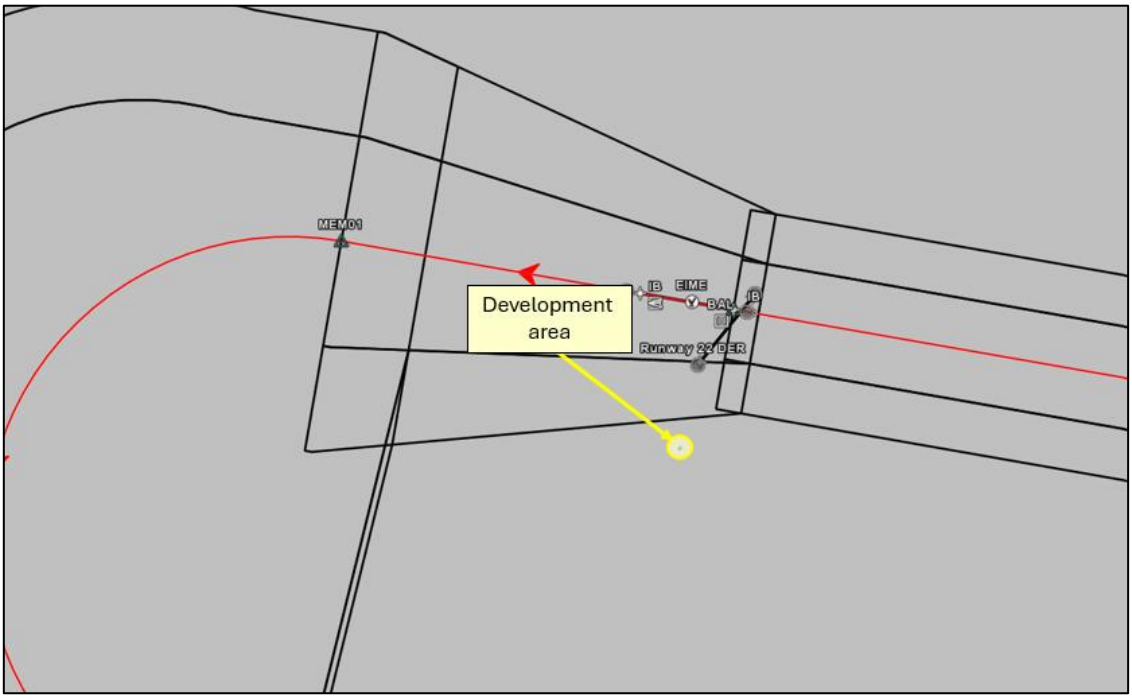


Figure 4-19. RNP (LNAV) Approach RWY 28

LNAV-VNAV

Since laterally the VNAV minima is bounded by the perimeter of the respective LNAV minima, it is concluded that the proposed development is outside the LNAV/VNAV Obstacle Assessment Surfaces (OAS).

LPV

The proposed developments are positioned outside the LPV minima Obstacle Assessment Surfaces (Figure 4-20).

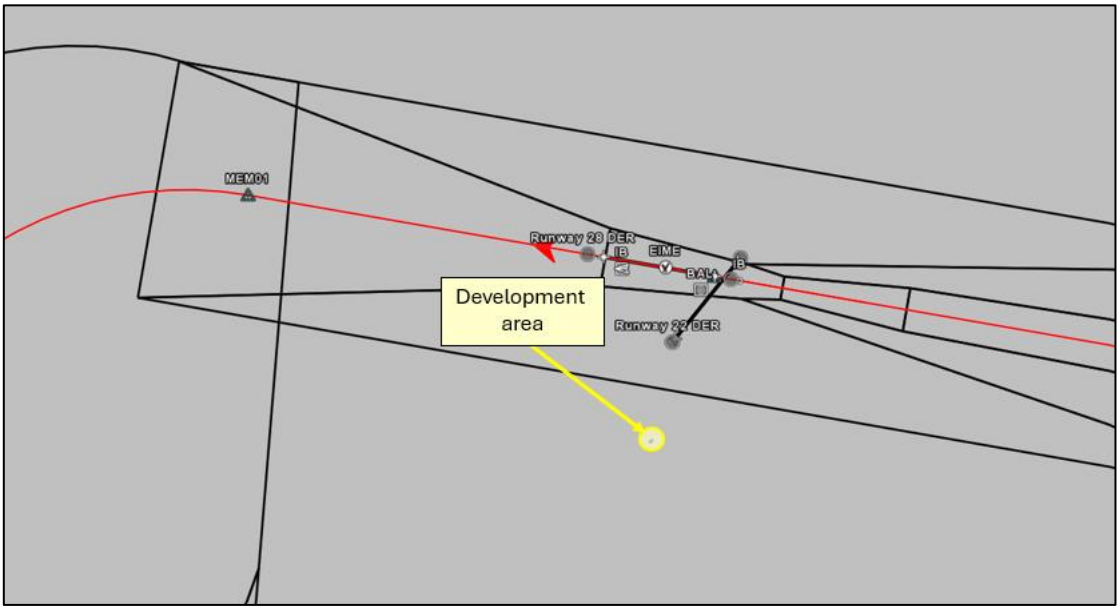
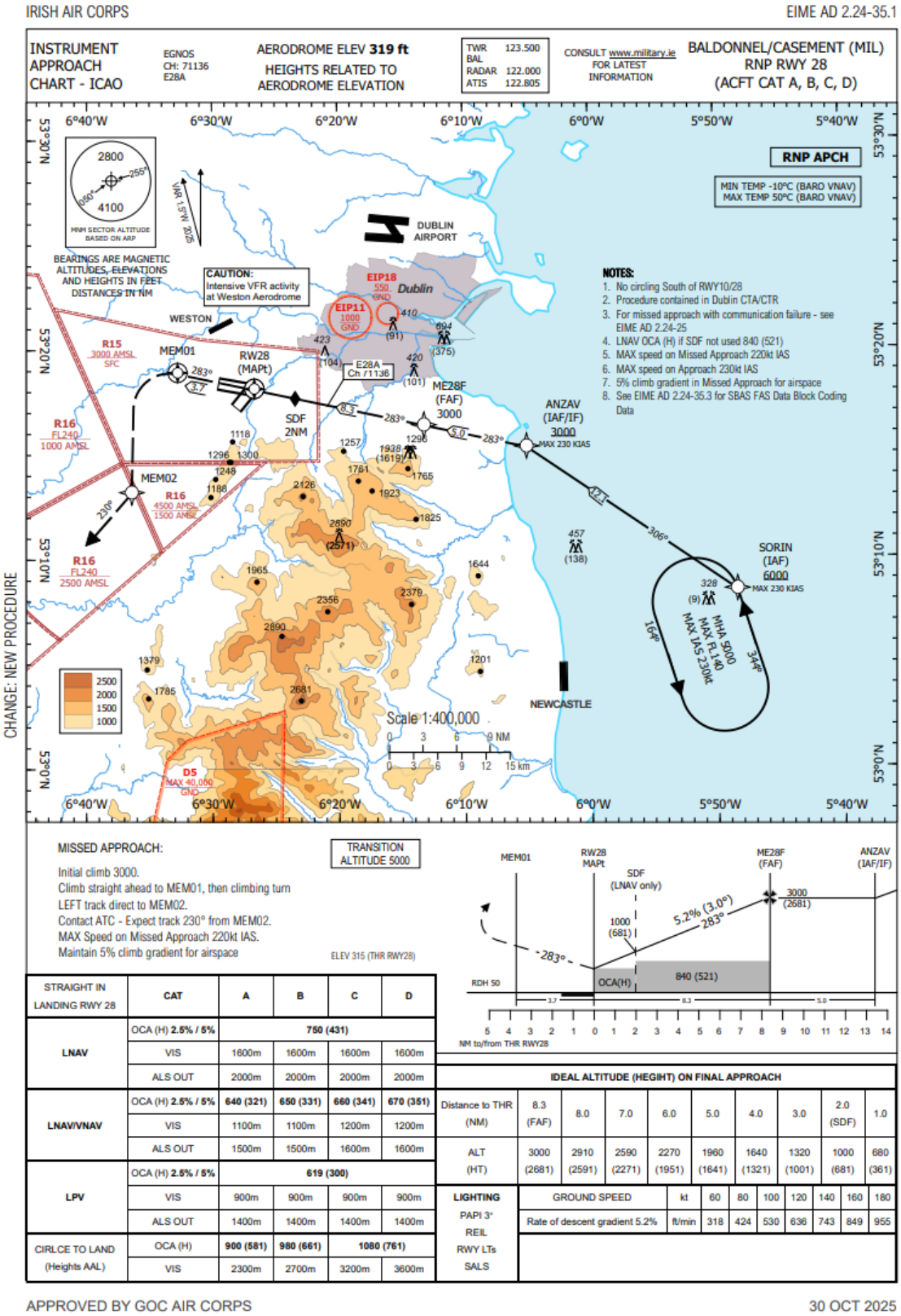


Figure 4-20. RNP (LPV) Approach RWY 28



STRAIGHT IN LANDING RWY 28	CAT	A	B	C	D
LNAV	OCA (H) 2.5% / 5%	750 (431)			
	VIS	1600m	1600m	1600m	1600m
	ALS OUT	2000m	2000m	2000m	2000m
LNAV/VNAV	OCA (H) 2.5% / 5%	640 (321)	650 (331)	660 (341)	670 (351)
	VIS	1100m	1100m	1200m	1200m
	ALS OUT	1500m	1500m	1600m	1600m
LPV	OCA (H) 2.5% / 5%	619 (300)			
	VIS	900m	900m	900m	900m
	ALS OUT	1400m	1400m	1400m	1400m
CIRLCE TO LAND (Heights AAL)	OCA (H)	900 (581)	980 (661)	1080 (761)	
	VIS	2300m	2700m	3200m	3600m

IDEAL ALTITUDE (HEGIHT) ON FINAL APPROACH									
Distance to THR (NM)	8.3 (FAF)	8.0	7.0	6.0	5.0	4.0	3.0	2.0 (SDF)	1.0
ALT (HT)	3000 (2681)	2910 (2591)	2590 (2271)	2270 (1951)	1960 (1641)	1640 (1321)	1320 (1001)	1000 (681)	680 (361)

LIGHTING	GROUND SPEED	kt	60	80	100	120	140	160	180
PAPI 3°	Rate of descent gradient 5.2%	ft/min	318	424	530	636	743	849	955
REIL									
RWY LTs									
SALS									

Figure 4-21. Chart RNP Approach RWY 28

4.2.6 SRA approach RWY 10

There is one published approach chart for SRA approach RWY 10 (Figure 4-23Figure 4-14):

- EIME AD 2.24-20 - Instrument Approach Chart - SRA RWY 10, for CAT A, B, C, D.

The planned developments may have impact on the missed approach (M/A) procedure. The proposed developments are positioned outside the turn initiation area of the missed approach and shall be assessed for the turning M/A only after reaching an altitude of 1500 ft AMSL.

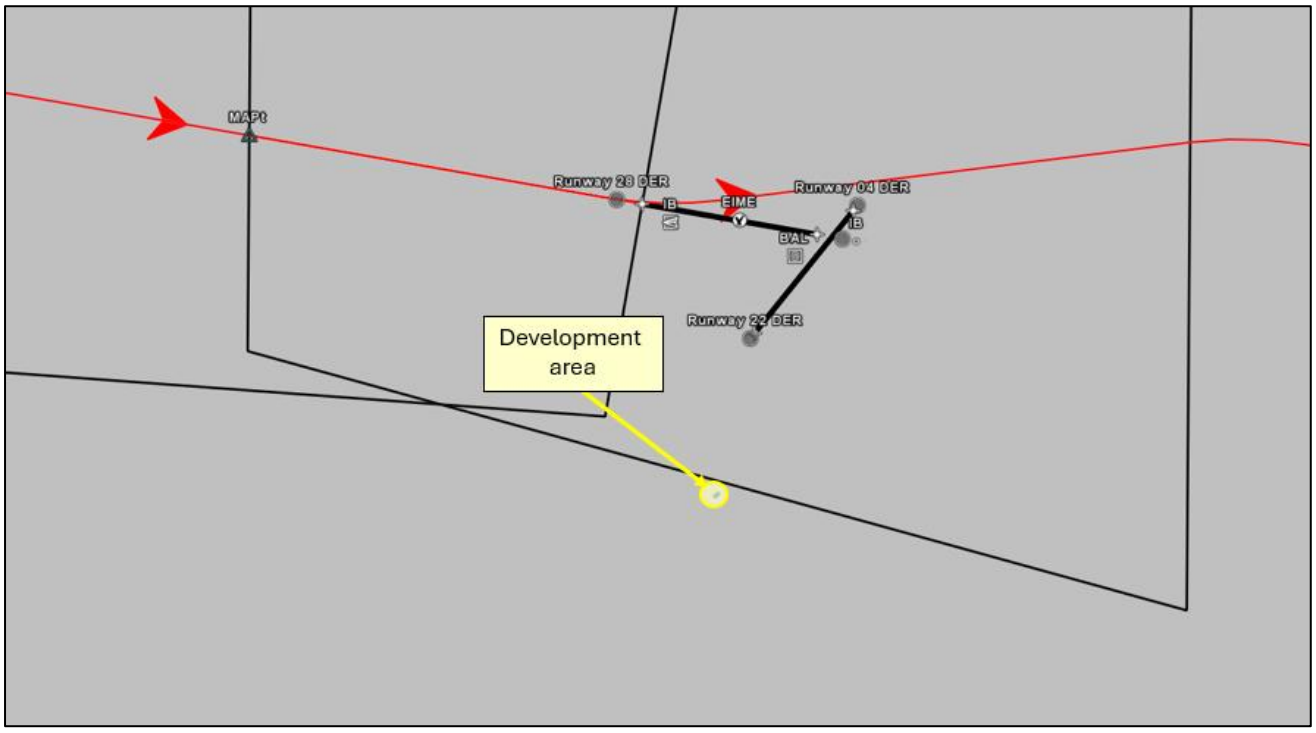


Figure 4-22 Missed approach of SRA approach RWY 10

The proposed developments are positioned outside the turn initiation area. The required TNA for an obstacle outside the turn initiation is calculated as follows for the SRA approach:

Required TNA = OBST_ELEV + MOC

It shall be noted that since the obstacles are positioned in the turn area then the d_0 should be also taken into consideration for a more accurate result (as reported in the detailed analysis below) the maximum obstacle elevation.

The planned obstacles would have no impact on the turning missed approach since the calculated Max OBST elevation in the turn area is higher than the proposed developments.

IFPs	OBST elevation	MOC	MAX OBST elevation		Published TNA	Impact OBST on IFP?
Tuning M/A SRA RWY 10	142.60 m	50.0 m	407.21 m	1336.96 ft	1500 ft	No

Table 4-11. Turning missed approach of SRA approach RWY 10 analysis and results (simplified)

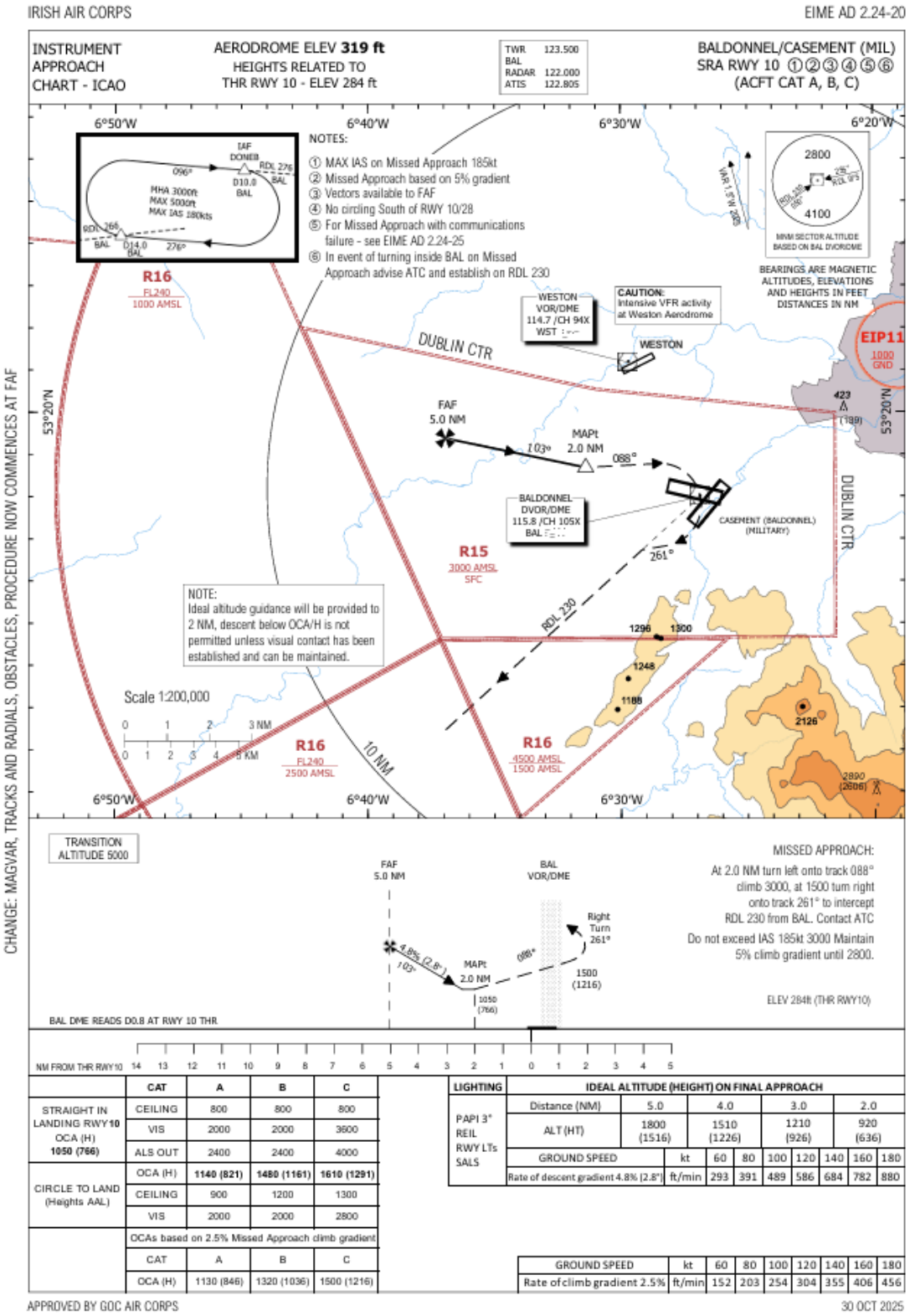


Figure 4-23. Chart SRA Approach RWY 10

4.3 Circling approaches

From the approach charts it can be derived that circling south of RWY 10-28 is not permitted. The proposed developments are located outside the areas related to the Circling approach procedures. Therefore, the proposed developments do not impact this solution.

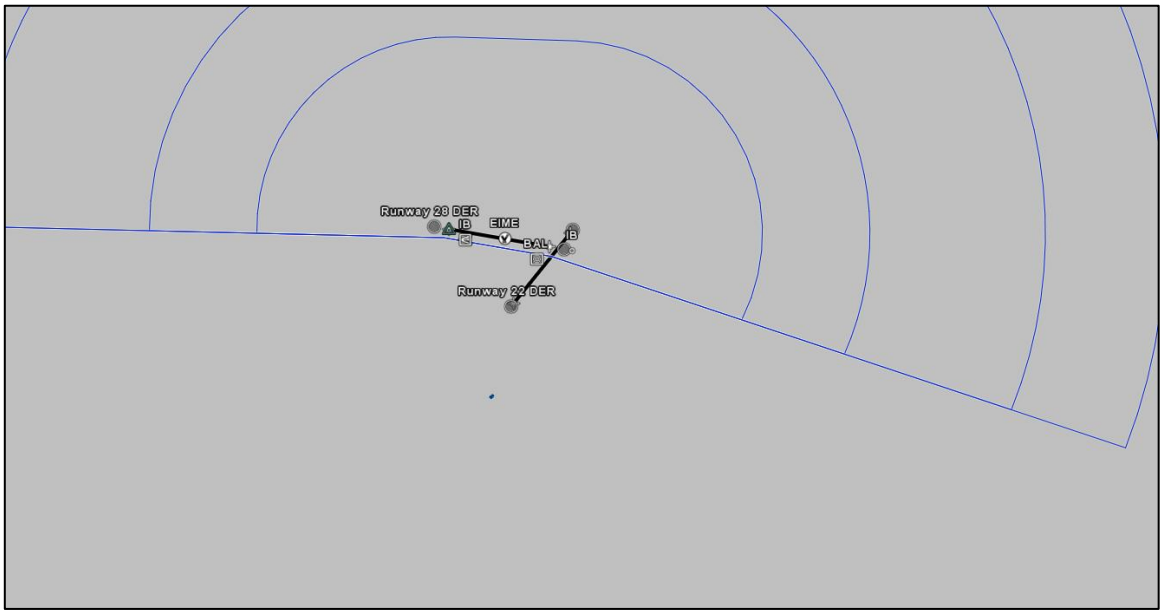


Figure 4-24. Circling approach

4.4 Holdings

The holdings at IAF DONEB (ILS Z/ILS Y charts) and IAF ERLIC (ILS X/ILS Y charts) are not vertically affected by the proposed developments (Figure 4-25). Holdings at SORIN and KERAV are not laterally, and therefore vertically, affected by the proposed developments.

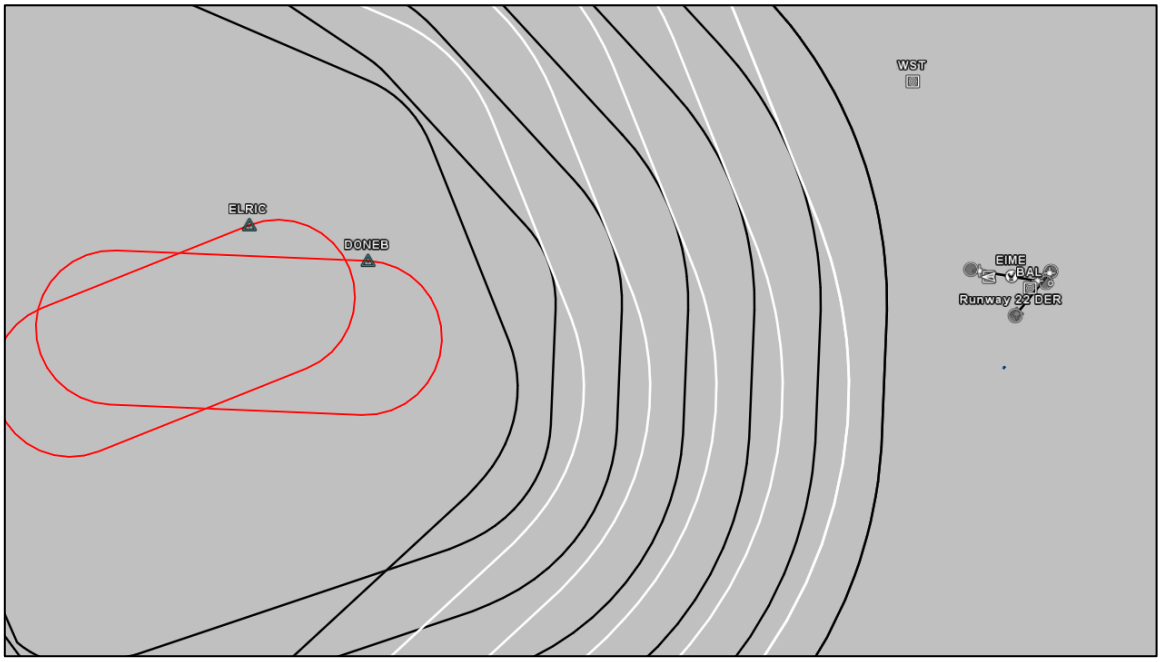


Figure 4-25. DONEB and ERLIC Holdings

4.5 Minimum Sector Altitude

The Minimum Sector Altitude (MSA) is the lowest altitude which may be used under emergency conditions that still provides an MOC (Minimum Obstacle Clearance) of 300 m above all obstacles located in a 25.0 NM radius (plus 5.0 NM buffer area) around the ARP or another specified centre point.

The MSAs at EIME are divided into two sectors as shown in the picture below. The obstacles are positioned in the sector south of DAP DVORDME/ARP, which has an altitude of 4100 ft. However, the obstacles may also have impact on the northern sector (2800 ft), since obstacles within a buffer zone of 9 km (5.0 NM) around the boundaries of any given sector shall be considered. As show in the table below none of the Minimum Sector Altitudes are affected.

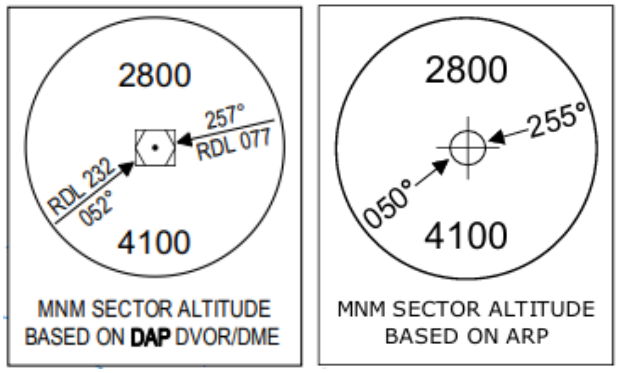


Figure 4-26. MSA published on the approach and SID charts

IFP	OBST elevation	MOC	Required OBST clearance ALT (rounded as required)		Published ALT	Impact OBST on IFP?
MSA (Sector 2800 ft)	142.60 m	300.0 m	442.60 m	1452.08 ft (1500 ft)	2800 ft	No
MSA (Sector 4100 ft)	142.60 m	300.0 m	442.60 m	1452.08 ft (1500 ft)	4100 ft	No

Table 4-12. Published MSA analysis and results

4.6 Minimum Vectoring Altitudes

There are no radar minimum vectoring altitudes published above the aerodrome, and the location of the proposed developments, as can be seen on the ATC radar vectoring chart (Figure 4-27).

In area R16, west of the aerodrome, the indicated Minimum Vectoring Altitudes (MVAs) are 1800 and 2000 ft. When applying a 3.0 NM, or 5.0 NM, buffer on these areas the obstacles would still be outside these buffers; and if the obstacles were located in these areas, the MVAs would still be higher than the required obstacle clearance altitude for the obstacles (1600 ft, rounded to the nearest 100 ft interval).

IFPs	OBST elevation	MOC	Required OBST clearance ALT (rounded as required)		Published ALT	Impact OBST on IFP?
MVA	142.60 m	300.0 m	442.60 m	1452.08 ft (1500 ft)	NIL	No

Table 4-13. Published MVA analysis and results

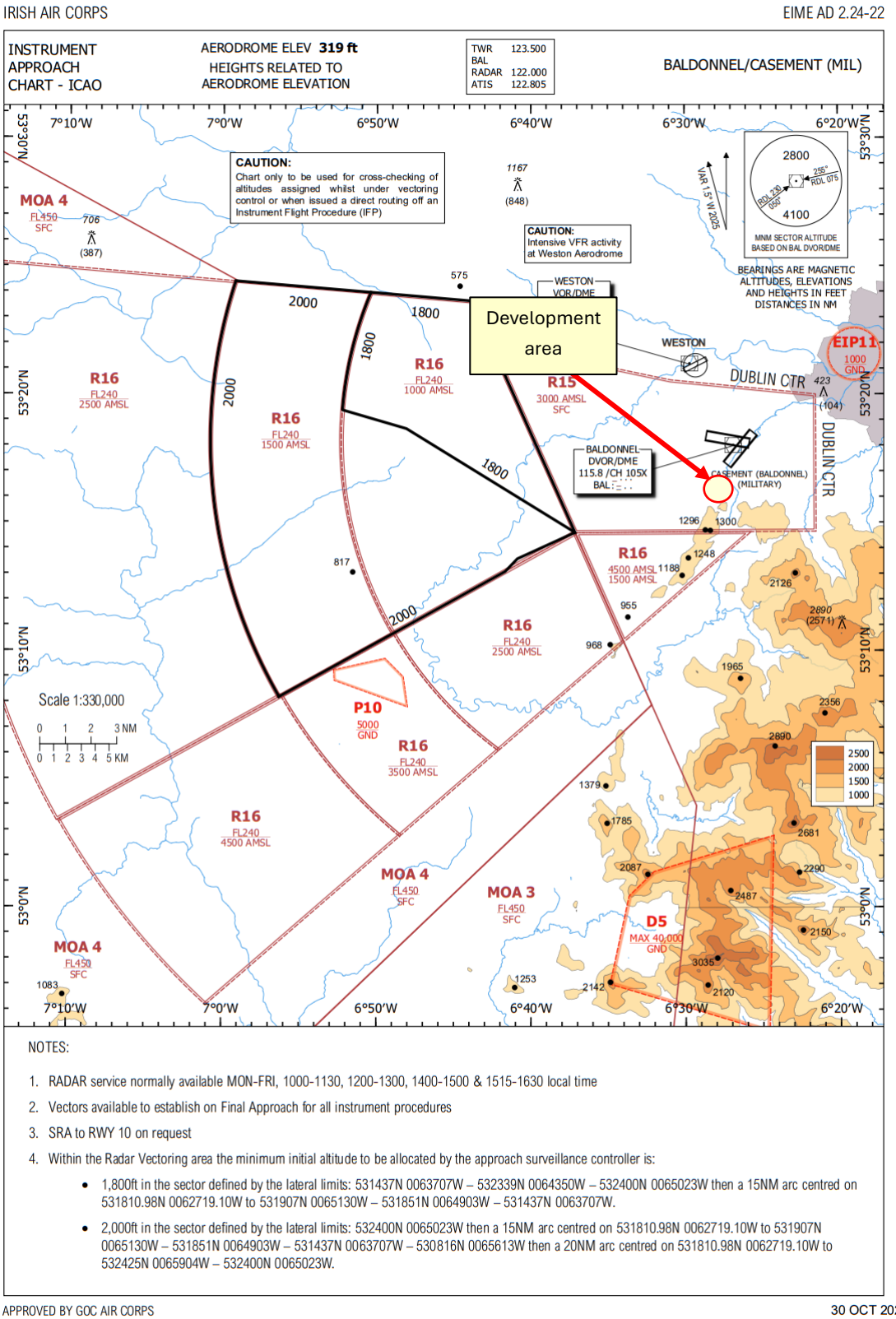


Figure 4-27. Published ATC Radar Vectoring Chart

5 Conclusions

It is concluded that, based on the evidence reported in the following aeronautical study, there is no interference between the two proposed developments and the Instrument Flight Procedures published for Casement Aerodrome (EIME) in Baldonnel.

Any change in the geometry of the proposed developments or change in the Instrument Flight Procedures considered for this aeronautical study will require further analysis.

Appendices

A.1 List of abbreviations

Abbreviation	Meaning
ACFT	Aircraft
AGL	Above Ground Level
ALT	Altitude
AIP	Aeronautical Information Publication
AMSL	Above Mean Sea Level
APCH	Approach
ARP	Aerodrome Reference Point
ATC	Air Traffic Control
CAT	Category
DER	Departure End of Runway
ELEV	Elevation (altitude above mean sea level)
FAF	Final Approach Fix
FAP	Final Approach Point
IAF	Initial Approach Fix
ICAO	International Civil Aviation Organisation
IF	Intermediate Fix
IFP	Instrument Flight Procedure
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
LNAV	Lateran Navigation
LOC	Localizer
LPV	Localizer Performance with Vertical guidance
M/A	Missed Approach
MAPt	Missed Approach Point
MCA	Minimum Crossing Altitude
MOC	Minimum Obstacle Clearance
MOCA	Minimum Obstacle Clearance Altitude
MSA	Minimum Sector Altitude

MVA	Minimum Vectoring Altitude
NDB	Non-Directional Beacon
OAS	Obstacle Assessment Surface
OBST	Obstacle
OCS	Obstacle Clearance Surface
OLS	Obstacle Limitation Surface
PANS-OPS	Procedures for Air Navigation Services – Operations
PDG	Procedure Design Gradient
QDR	Reciprocal Magnetic Bearing
QNH	Sea-level pressure. It is used to cause the altimeter to register height above sea level
RNAV	Area Navigation
RNP	Required Navigation Performance
RWY	Runway
SID	Standard Instrument Departure
SOC	Start of climb
STAR	Standard Arrival Route
THR	Threshold
VFR	Visual Flight Rules
VNAV	Vertical Navigation
VOR	Very high frequency Omnidirectional Radio range
VSS	Visual Segment Surface
WGS	World Geodetic System


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